FEA - CAE Not to Miss & More - Eclectic & Innovative

April ISSN 2694-4707

Monthly Town Hall Meeting
Engineering, Research, Interests
www.feantm.com

Curt - Autodesk


Eielson AFB

Baykar

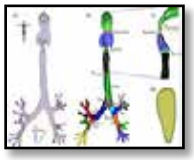
Bart- SDVerse

Abhinav - My Physics Café

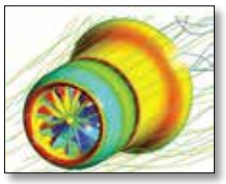

Bala – CAE Knowledge Quiz


Jenson - DFE Tech


Marco – RBF Morph

Metin - OZEN Engineering

Madhukar- CADFEM


Mtg. Rm - Mazen - Ansys


Marjorie – Altair


Mtg.Room - Ryck – Goengineer


AUTO – Mercedes

Library – Alan - True Story


Aaron – Dynas+

FEA NOT TO MISS & MORE

FEA not to miss a/k/a (FEANTM) **a collective of individuals who exchange information**
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…from that point onward, you are removed - yes you can always come back.

Editors: **(alpha order) Anthony, Art, Brett, Churchill, Marnie, Marsha, Sabyl, Shweta, Taylor**

Jr. Editors**: Rheannon and Kensington (yes, she likes pink)**

Town Pretend to be Editors:

The Old Rancher	**No one in town knows his name. You yell "Hey, Old Rancher."**
The Old Pilot	**No one in town knows his name. You yell "Hey, Old Pilot."**
The Old Racer	**No one in town knows his name. You yell "Hey, Old Racer."**

They are all brothers - strange family

Town AI Editors:

The Robbins Family: Bart & Marjorie Robbins & the 3 Robbins Brothers – Grayson, John, Rick,

Contact us at: feaanswer@aol.com

Attribution: Map Vector & town vector graphics are courtesy of vecteezy

We will always remember

Parking & Coffee is free.

R & D - Camping - Town Map

Horse Trail → Yield right of way to horses

R & D Technology
Business Park Plaza

RV CAMPING
Park in any vacant camping site

Town Hall

CADFEM · OFETECH · DOZEN · d3View · Oasys · rescale · ENGINSOFT · Ansys · AUTODESK

Fire & Police Depts.

Lawrence Livermore National Laboratory

SIMQ

Wake Forest University School of Medicine

rbf

MEDITATE

Auto Race track & Auto Industry

Petting Zoo

Old Rancher

Riding Center

Convention Barn Welcome

Elect/Water. & Sewage Treatment Plant Facilities

- **Logos displayed represent companies/academia/research with solutions for today's world.**
- If you wish to have yours removed, kindly inform us at **feaanswer@aol.com**.
- Proceeds from the auction of your building will be allocated to the coffee budget.
- The map is subject to change - building sites will be rotated accordingly.

Table of contents

- **The individuals mentioned are the persons we wish to thank for articles on the internet.**
- **The above doesn't imply that they are the author, with a particular company, or department**

Page 03 Town Map – technology business park, camping and our town – free coffee!

April Town Hall

Table of contents

Welcome to our Town Hall Meeting & Announcements

Town Hall Meeting

Park Cars behind building
Park Tractors behind cars
Tie horses to hitching rails

Free coffee & chocolate cake and ice cream

The town consists of individuals who are passionate about finding solutions, as well as caring about animals and children.

Town Gossip is at the local coffee shop.

Pets are welcome. Horses, pet goats stay outside.

1. TA DA DA (Bugle announcement) Welcome Dynas+ Engineering Products - Europe. See Aaron who will be doing the introduction.
2. Our special crash guests are Tommy and Fred! You don't know Tommy and Fred? See Automotive – Mercedes
3. I banged the famous town hall meeting Gavel to start the meeting! It's new & this one I chained to the podium. BANG - BANG! Who yelled, "OH NO Not the GAVEL again?"

This month has taken eclectic to new heights – "Secretary, eclectic means we have a lot of different things in the news." "Why didn't I just say that? Okay, this month we have a lot of different things in the news."

I will close my opening meeting talk with let's all get the coffee and start reading this month FEANTM. (whispering – it's eclectic!)

Special Announcement Board: Marta – OASYS LS-DYNA Environment: "Don't miss our team at the 2024 GHBMC Users' Workshop on 24th April in Michigan, USA! As proud sponsors, we look forward to meeting you at our booth where you can find out more about our products and expertise."

Article:
G. Ibarra: "Tidal energy is a form of renewable energy generated from the movement of ocean tides, and tidal turbines harness this energy to generate electricity."

Article:
C. Mayhofer - To achieve top performance in road cycling, the focus is increasingly on the perfect frame - lightweight, stiff, & aerodynamics.

Meeting Room:
AI-enhanced simulations speed up design & optimization across industries, in which accuracy and efficiency are critical.

Research Hospital:
A Parametric 3D Model of Human Airways for Particle Drug Delivery & Deposition - more personalized and effective strategies for patients suffering from respiratory condition.

Dynas+ Engineering Products website, "A Technical Centre of DEP MeshWorks for the European territory."

DEP MeshWorks is an integrated CAE platform for pre and post processing, involving rapid concept CAE and CAD model generation, parameterization and optimization, advanced meshing, process automation, concept modeling and CAD morphing."

Dynas+ Engineering Products

Your Technical Partner in Europe

Dynas+ Engineering Products stands as a dedicated European Technical Centre and trusted partner/reseller for Detroit Engineered Products. Our operations revolve around the time-saving capabilities of DEP MeshWorks, enabling us to offer top-notch CAE expertise across various industries within the European territory. Leverage our extensive services, and let us aid in your journey towards innovation and efficiency.

Beyond its long-standing LS-DYNA solvers expertise (more than 20 years), Dynas+ has created strategic partnerships with others major editors in order to get a more global and simplified approach of the complete simulation process. This includes extensive parameterization, geometrical and topological optimization, CAD-CAE integration/association, sensitivity studies, parameters identification and automatic experimental results fitting.

In that scope, Dynas+ choose the DEP MeshWorks software platform for its engineering department and became DEP MeshWorks Europe Technical Centre.

Get quickly up to speed on DEP MeshWorks- Our "How to" series of tutorials!

Presented at the 16th Int'l LS-DYNA Users Conference

Conf. Web - Drag Coefficient Optimization for a Sports Car Using the Coupling Between LS-DYNA® ICFD Solver, LS-OPT® and DEP MeshWorks Software

M. Seulin, M. Le Garrec, A. Poncet, I. Caldichoury, K. Gudlanarva
DynaS+ France - ANSYS LST - Detroit Engineering Products

My Physics Café: CAE Analyst and a passionate blogger

There you are! How does a Smartphone know your exact location? Have you ever found yourself in a situation where you are stuck at a place, unsure of where to go next? This can be very frustrating, especially if you are new to that place.

How does the Smartphone know your exact location?

If you are like most people, you probably look for places on your smartphone, navigate towards it and end up getting there without any issues. This is exactly what Google Maps does.

With this handy application, you can navigate towards any destination easily and fast with no fuss.

Your Smartphone uses Global Positioning Satellites (GPS) that allow it to gather accurate information about your exact location - so that there's never a wasted trip!

Let us understand how this technology works. The answer lies in outer space, some 12 000 miles above your head in an orbiting satellite powered by Quantum physics! But, let's break down the concept into earthbound terms.

Your cell phone needs to know how far it is from the satellite. Each satellite in space broadcasts radio signals that travel from space to your phone at nearly 299,792, 458 meters per second (speed of light).

Then your phone records the signal arrival time and uses it to calculate the distance to the satellite with the help of a simple formula:

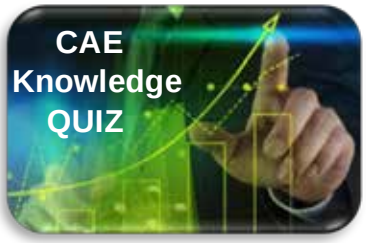
Distance = Speed of light x Signal arrival time.

To accurately calculate the distance of your device from the satellite, atomic clocks are utilized in satellites. These clocks work on the principles of quantum mechanics and as a result, are a lot more precise than conventional clocks. They can give a time reading accurate to within 1 billionth of a second!

We now know that you are at a fixed distance from the satellite. In other words, you are somewhere on the surface of a sphere centered around this satellite. By measuring your distance from another satellite with the same procedure, we get two overlapping spheres. With at least three such overlapping spheres centered around three different satellites in space, your exact location on the sphere (earth) gets pinpointed.

And surprisingly, all this is accomplished within 2-4 seconds! Now, how cool is that?

BALA – Automotive CAE Enthusiasts! Test your knowledge with our quick quiz and see how much you know about the cutting-edge world of Computer-Aided Engineering in the automotive industry.



Join me for tuning up your CAE knowledge.
Brush up by answering below Quiz

The answers are on the following page

Question 1: In automotive CAE, which element type would be most appropriate for modeling thin sheet metal components in a crash simulation?

A) Solid elements
B) Shell elements
C) Beam elements
D) Tetrahedral elements

Question 2: When conducting a modal analysis in CAE, what is the primary outcome that engineers seek to understand?

A) The color spectrum of the vehicle under sunlight
B) The thermal conductivity of engine components
C) The natural frequencies and mode shapes of a structure
D) The fuel efficiency at maximum load

Question 3: In CFD analysis for aerodynamics, what does the term 'Y+ value' refer to, and why is it important?

A) It refers to the positive direction on the Y-axis for better visualization
B) It's a measure of the turbulence model's near-wall mesh resolution, critical for boundary layer predictions
C) It indicates the year-plus value for software versioning
D) It's the profit margin indicator for automotive companies

Question 4: Which numerical method is most commonly used in FEA for solving partial differential equations in structural analysis?

A) The Monte Carlo method
B) The Galerkin method
C) The Newton-Raphson method
D) The Euler method

Question 5: In the context of CAE for noise, vibration, and harshness (NVH) studies, what does the term 'modal damping ratio' signify?

A) The ratio of actual damping to critical damping in a given mode
B) The difference in sound levels inside and outside the vehicle
C) The aesthetic appeal of the vehicle's design
D) The efficiency of the vehicle's braking system

CAE Knowledge Quiz Answers

Question 1:

B) Shell elements

-- Shell elements are ideal for modeling thin structures like sheet metal in crash simulations due to their ability to accurately represent bending and in-plane forces.

Question 2:

C) The natural frequencies and mode shapes of a structure

-- Modal analysis is used to determine the vibration characteristics (natural frequencies and mode shapes) of a structure, which is crucial for avoiding resonance and ensuring structural integrity.

Question 3:

B) It's a measure of the turbulence model's near-wall mesh resolution, critical for boundary layer predictions

-- The Y+ value is essential in CFD to ensure accurate boundary layer flow predictions, particularly in aerodynamic simulations.

Question 4:

B) The Galerkin method

--The Galerkin method is widely used in FEA for transforming partial differential equations into a discrete system of equations that can be solved numerically, particularly in structural analysis.

Question 5:

A) The ratio of actual damping to critical damping in a given mode

--The modal damping ratio is a key parameter in NVH studies, indicating how quickly a vibrating system dissipates energy, which is crucial for understanding and mitigating unwanted vibrations.

Grow together - Bala

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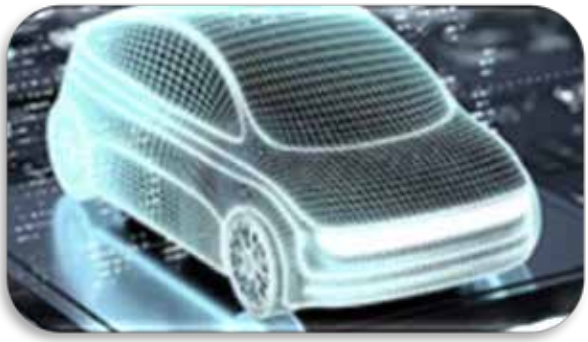
From the website: SDVerse is a game-changing buying and selling marketplace focused on the commercialization of automotive software, enabling the software-defined future of the industry.

This independent marketplace was developed in collaboration between GM, Magna, and Wipro, and is available to all OEMs, suppliers, and other companies with relevant software offerings and tools.



Web - General Motors, Magna, and Wipro Team Up to Develop Automotive Software Marketplace: 'SDVerse'

General Motors (GM), global automotive supplier Magna, and leading technology services and consulting company Wipro Limited, have teamed up to develop a B2B sales platform for buying and selling automotive software. The platform, called SDVerse, aims to revolutionize the automotive software sourcing and procurement process by providing a matchmaking platform for buyers and sellers of embedded automotive software.

- SDVerse serves as a 'matchmaking' platform between buyers and sellers of embedded automotive software
- Focuses on matching automotive software buyers and sellers, over captive software development
- The digital platform increases transparency and reduces inefficiencies in software development and procurement
- Ampere*, FEV, Forvia, HL Mando, NXP Semiconductors, TTTech Auto, and Valeo lead a "Launch Partner" group supporting SDVerse
- Prashant Gulati has been named CEO of the new SDVerse organization effective March 5th, 2024

Unlike the traditional captive software development approach, SDVerse focuses on connecting automotive software buyers and sellers through a transparent and efficient digital platform. Sellers can list their software's features and attributes, while buyers can easily search and explore the available software products through a comprehensive catalogue.

EXCERPT

Sales and purchases can be connected directly through the platform, offering a seamless experience for all participants. SDVerse is currently in development and expected to feature hundreds of automotive software products, and participants from across the automotive value chain are invited to join. In addition to the founding members, an exclusive "Launch Partner" group is already in place led Ampere*, FEV, Forvia, HL Mando, NXP Semiconductors, TTTech Auto, and Valeo.

Prashant Gulati has been named CEO of SDVerse effective March 5th, 2024. Prashant has more than two decades of experience launching and leading automotive organizations and is a thought leader in software technology, maximizing the potential of emerging technologies, such as AI, in the automotive industry.

"The market for automotive software is expected to nearly double this decade, potentially outpacing the growth of software development talent pools" said Harmeet Chauhan, Global Head Wipro Engineering Edge, Wipro Limited. "The current paradigm for software sourcing will likely not be able to overcome this growing gap without sacrificing both profitability and the auto industry's aspirations for software defined vehicles. SDVerse addresses these pain points, offering a wide range of benefits across the industry."

“Automotive grade software development is rapidly transforming, and we all need to ask ourselves how we get customers really unique differentiating features faster. Part of that is identifying the common underlying code that can be shared in the name of higher quality and lower costs for our end customers,” said Dan Nicholson, Vice President, Strategic Technology Initiatives, General Motors. “This first-ever software marketplace creates an independent, industry-driven one-stop-shop for embedded systems software, significantly expanding access to new innovations, helping to drive down cost, and allowing companies like GM to implement critical software more quickly.”

Potential key subscriber benefits of SDVerse include:

- Reduced cost, time, and complexity, by eliminating duplication of efforts, enabling reuse of already-developed software, and allowing higher economies of scale by bundling software orders through multiple clients
- Higher quality of software, which has already undergone increased cycles of testing and validation. Additionally, the free-market approach improves customer vehicle quality through competition
- Improved resource allocation, which allows OEMs and suppliers to deploy engineering resources to innovate in areas that improve and differentiate driver and passenger experiences, and minimize time spent ‘reinventing the wheel’
- Improved revenue for sellers, through an expanded client base and opportunities to monetize existing IP
- New approach to software sourcing, allowing companies to source software separately from hardware, and to create an attractive alternative to OEM insourcing of software development

“Magna’s participation in SDVerse is driven by our ongoing commitment to foster collaboration and drive the automotive industry forward," said Joerg Grotendorst, Senior Vice President, Corporate R&D at Magna. "By embracing this innovative platform, we aim to create a more interconnected ecosystem that encourages OEMs, suppliers, and specialty software developers to collaborate and co-create cutting-edge solutions. SDVerse represents a transformative opportunity to revolutionize software development, sales, and sourcing processes, ultimately accelerating the industry's transition to the software-defined vehicle."

GM, Magna, and Wipro collectively designed and developed SDVerse, which will be governed collaboratively by the founding members. Global strategy consultant Roland Berger has served as the project’s strategic advisor since the program’s inception.

Konstantin Shirokinskiy, Partner, Roland Berger added, “SDVerse offers a blueprint for OEMs and suppliers to address their embedded software needs more efficiently. It frees up scarce software engineering resources required to roll out new differentiated software features, reorganizes development timelines to more quickly develop better SW-enabled vehicles, and ensures software is valued properly. Companies can streamline their operations, becoming more focused, efficient and profitable.”

To learn more about SDVerse, visit (https://www.sdverse.auto/)

*Ampere is the EV and Software pure player of Renault Group

News from Livermore, CA - LLNL

Excerpts - Lawrence Livermore National Laboratory (LLNL) has received $1 million to explore technologies that stimulate hydrogen production from mineral deposits found in the subsurface, including developing our understanding of hydrogen-producing geochemical reactions and how to enhance or control the rate of hydrogen production.

Web - **Hard as a rock, LLNL to study geologic hydrogen production**

The use of hydrogen fuel to offset fossil fuel applications could assist efforts to reduce climate change impacts if it can be produced via methods that do not intensify greenhouse gas emissions (GHG) and climate impacts.

LLNL scientist Maria Gabriela Davila Ordonez manipulates the high-pressure hydrogen system for the Subsurface Hydrogen Assessment, Storage and Technology Acceleration (SHASTA) project. Photo by Garry McLeod/LLNL.

“Geologic hydrogen production is one alternative to current hydrogen production methods that could offer from lower to no GHG emissions and potentially lower costs, given the vast subsurface resources of magnesium and iron- bearing minerals,” said LLNL principal investigator Maria Gabriela Davila Ordonez.

LLNL is among 16 projects across eight states, funded through

two DOE Advanced Research Projects Agency-Energy (ARPA-E) Exploratory Topics, to accelerate the natural subsurface generation of hydrogen. This energy resource would potentially produce no carbon emissions when burned or used in a fuel cell and will support efforts to reduce costs and enable commercial-scale deployment of clean hydrogen.

The LLNL project specifically will increase the rate of hydrogen generation from olivine and olivine-bearing rock assemblages using short-chain organic acids as chemical stimulants. Davila Ordonez said both technologies have cost and GHG offset benefits; the challenge lies in delineating their applicability to subsurface reserves of variable quality and at different locations. The team will assess short-chain organic acids for their ability to further stimulate mineral breakdown and subsequent iron oxidation and coupled hydrogen production.

“The benefits of using organic acids are twofold: hydrogen production and recovering rare earth minerals and other critical materials of interest that help offset the costs of implementing this technology at large scale,” Davila Ordonez said.

The technology can be applied above-ground to mined rock and wastes, or potentially in situ at depth, pending selection of durable, low-cost acids. For both technologies, real-time monitoring of hydrogen production rates will help optimize performance. Ultimately, Davilla Ordonez said the project results will allow for recommendations for site selection, plant design and technology implementation for production of low-cost hydrogen.

EnginSoft - From the abstract: This technical article describes a project undertaken by OPEM to optimize & validate the laws of motion governing the moving operations of a machine that produces coffee capsules, namely the cut and weld unit, the film feeder, the conveyor and the support structure. Capacity is the most important feature of an automatic packaging machine since it defines its main competitive advantage. As a result, OPEM's designers are constantly looking for new solutions to increase the capacity of their machines without compromising costs, size & efficiency.

Improving a coffee capsule machine's capacity and performance using multibody simulation - Improvements achieved by optimizing laws of motion governing machine components

Newsletter EnginSoft Year 16 n°3 - **By Davide Marini, EnginSoft**

Excerpt OPEM S.P.A was founded by Fabio Binacchi in 1974 in Parma as a small, family-run company which started with the purchase of a pasta business that laid the foundations of the future OPEM. .. The rise of the rapidly booming market for pods and capsules gave the company the opportunity to grow and expand, thanks to their foresight in producing very flexible systems that can be customized to meet many customers' requests…

Abstract - The main objective of this project was to increase the machine's capacity by 25% without affecting the architecture and size of the machine. **Using an iterative approach, EnginSoft's engineers generated multibody models developed in RecurDyn,** to assist OPEM's designers to reduce the cycle time for performing the moving operations by well over 25%.

The RecurDyn models were also used to correctly size the main components of the machine, to verify the machine's dynamic behavior when subjected to the new laws of motion implemented, and to calculate the loads acting on the frame, which were subsequently used for structural verifications.

Capacity is the most important feature of an automatic packaging machine since it defines its main competitive advantage. OPEM's designers are constantly looking for new solutions to increase the capacity of their machines without compromising costs, size and efficiency.

This project focused on a machine for the production of coffee capsules. The main objective was to increase capacity by 25% without affecting the architecture and size of the machine. The machine's operations can be divided in two main areas: 1) Stationary operations; 2) Moving operations.

The filling and sealing of capsules are "stationary operations". During these operations, the capsule must remain stationary for a prescribed amount of time. The forward movement of the capsules, and the feeding, cutting and transport of the sealing film are "moving operations". Stationary operations were not addressed by this project (i.e. the time constraint resulting from these operations remained the same). As a result, the cycle time for performing the moving operations was reduced by well over 25%.

To achieve the desired objective OPEM partnered with EnginSoft to optimize the laws of motion governing different mechanisms. The optimization process was supported by multibody simulations performed in RecurDyn to verify the dynamic behavior of systems subject to these new and highly demanding laws of motion.


Fig. 1 - Cut and weld unit


Fig. 2 - Film feeder

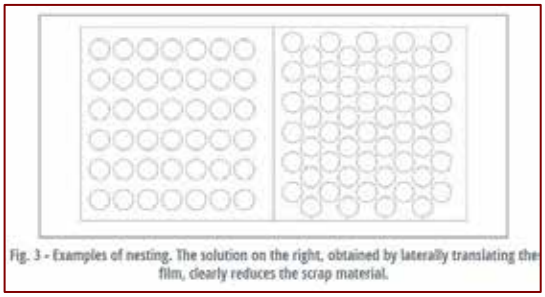


Fig. 3 - Examples of nesting. The solution on the right, obtained by laterally translating the film, clearly reduces the scrap material.

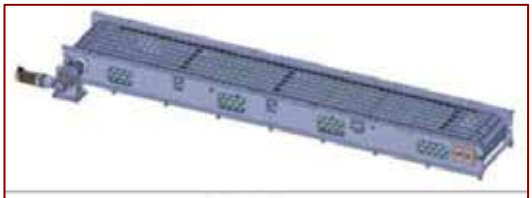


Fig. 4 - Conveyor

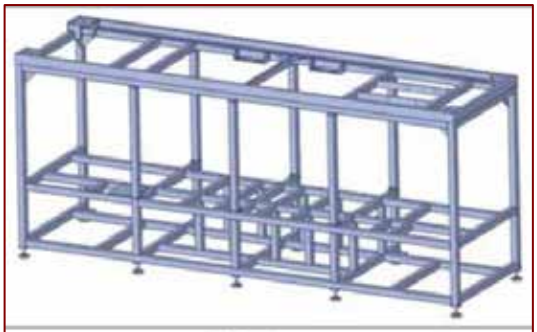


Fig. 5 - Structure

The mechanisms analyzed can be divided into four units:

Cut and weld - Film feeder - Conveyor - Structure

The cut and weld unit (Fig. 1) cuts the film into circular portions and transports and seals them on top of the capsules. To perform these operations, the components of the unit are moved by two electric motors. The motion applied by the electric motors is transferred through a series of four-bar linkage mechanisms and crank mechanisms, which determine a nonlinear relationship between the movement of the motor and the motion of the end effector.

The film feeder (Fig. 2) supplies the film to be cut and sealed. The movement of the film is controlled by several electric motors to apply the correct tension and to align the film correctly. When performing the cutting operation, the nesting of the holes is very important to reduce the amount of scrap material. OPEM's designers included a crank mechanism which translates the entire film feeder unit resulting in better nesting of the holes and thus reducing scrap material (Fig. 3). The current study focused on this lateral movement of the unit since the advancement of the film is already well-known to the OPEM designers and therefore no further study was requested on this topic.

The conveyor (Fig. 4) moves the capsules. The empty capsules are automatically loaded at one end of the machine. At the beginning of each cycle the capsules are moved one step forward until they reach the other end of the machine where they are unloaded. The capsule supports are fixed to two chain mechanisms consisting of several hundred chain links, supporting guides and four sprockets. An electric motor is directly connected to two of the four sprockets and rotates them at the beginning of each cycle to advance the chain mechanism. **The last unit analyzed was the structure (Fig. 5)**. Built mainly of beams, it supports all the other units.

Please read on the website: Optimization of the laws of motion & Modelling

Conclusion - This study successfully improved the capacity of a capsule machine by 25% by optimizing the laws of motion governing the mechanisms that compose it. The optimization process was based on an iterative approach supported by multibody models developed in RecurDyn. These models were also used to correctly size the main components of the machine, to verify its dynamic behavior when subjected to the new laws of motion and to obtain the loads acting on the frame, which were subsequently used for structural verifications.


Fig. 8 - Overview of the RecurDyn model of the cut and weld unit including flexible bodies

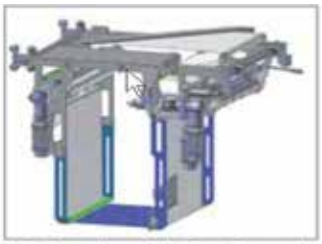


Fig. 9 - Overview of the RecurDyn model of the film feeder including flexible bodies

…

Autodesk – quote Selin Cinemre, "During the prototyping phase of product development, crucial decisions are made, requiring good judgment and questioning beforehand…The purpose of prototyping is to reduce the unknowns in initial product development work. Not asking the right questions before starting the prototyping process can lead to expensive design changes later on during product development.

Excerpts WEB – **Ask Yourself These Questions Before Prototyping** -by: Selin Cinemre

Building physical prototypes can be quite expensive. so, a good product development team will only prototype as much as necessary. A primary challenge for many teams, then, becomes knowing when it is advisable to prototype a product and understanding when a simulation is sufficient. Figuring this out requires a good understanding of the design lifecycle. It also hinges on asking yourself the right questions during the prototyping phase.

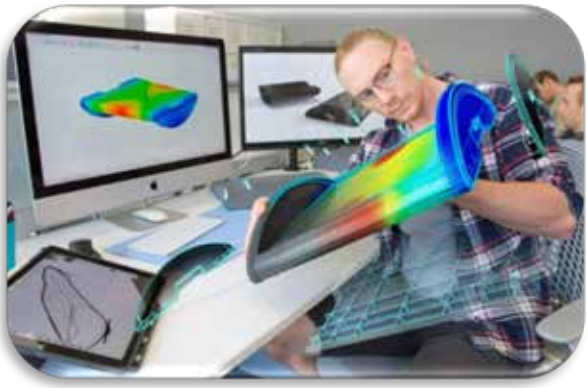
Can this idea be simulated?

The first question one should ask before building any prototype is whether it's something that could be simulated instead of prototyped. Simulations can help identify potential problems or limitations in the design before investing time and resources in physical prototyping. By detecting and addressing these issues early on, engineers can avoid costly mistakes and delays during the prototyping stage.

Autodesk Fusion has powerful simulation tools that can often reduce the need for physical prototyping, including FEA tools to simulate loading and the ability to simulate complex mechanisms.

Simulating iterations can quickly narrow down the concepts that you want to physically build. Therefore, it's important to ask yourself if you can simulate results before developing a new prototype.

Do we understand what's really important yet?



Once the design concepts have been narrowed down to one or two options, a skilled product development team will meticulously craft the prototypes with careful consideration.

Before jumping into physical prototype development, it's important to nail down the purpose you want the prototype to serve.

What are the biggest unknowns that we want to test?

- What are the critical functions that need to be proven?
- Do we want to test an integrated system or a series of smaller simpler prototypes?
- Plus, you always need to consider if a prototype will

During product development, there are always important functional questions to ask. However, zooming out and figuring out the answers to these questions will help you develop a strategic approach to prototyping and hopefully cost you the need to build multiple prototypes.

How will we deal with lead times?

There are numerous strategies to minimize prototype lead times and costs. Engineers should consider modifying off-the-shelf products or components to create prototypes, as this significantly reduces expenses and allows more time for testing. 80-20 aluminum extrusions are another common technique for quickly building up development framing and structures. Fusion can import many common CAD file formats which can ease layout and design when utilizing off-the-shelf components during prototyping.

If you can't use an off-the-shelf component, 3D printing is often the quickest way to get a prototype in hand. Even if there is fabrication capability on-site, 3D printing is often still faster and, depending on size, can give the team parts in hand on the same day. Be careful when relying on printing, though, as it is easy to design parts that can be 3D printed but can't be replicated using mass production processes.

Custom machining is usually the last but necessary resort for prototype fabrication. Autodesk Fusion CAM tools can be used to speed up the process and give the development team insight into the process. However, even in-house machining can often take days or weeks to turn parts around.

If ordering prototype parts from an outside vendor, the lead time can often be weeks. In this case, especially on large, costly, parts, it is good to implement design for manufacturing practices when prototyping. This can save machining time and hence costs on one of the most expensive steps in the product design process.
Autodesk Fusion for prototyping

Prototyping can be costly and time-consuming, but Autodesk Fusion offers tools to streamline the process and reduce expenses. Asking the right questions early on and minimizing uncertainties before transitioning from digital to physical prototypes is crucial. Effective prototyping yields long-term benefits throughout the product development cycle and should be priority.

Autodesk – article quote - Bringing NYU students along for the ride **-** After experiencing a life-changing, mountain-biking accident that left Noel Joyce paralyzed from the chest down, he left his military career behind to pursue industrial design. Years later, he found his passion for biking again. But bikes for those with disabilities can be prohibitively expensive and difficult to repair.

One professor's adaptive mountain bike design becomes a global education experience - NYU | Project Mjolnir

Joyce decided to change that by designing his own adaptive mountain bike with Autodesk Fusion. As a New York University professor, he brought students from campuses around the world along for the ride with Project Mjolnir.

A life-long passion for bikes - As a child growing up in Ireland, Noel Joyce was obsessed with bicycles. For him, there was an incredible feeling of freedom when riding one. The mechanical side was also fascinating. He would often cobble together "Frankenstein bikes" from barely functioning parts in a quest to create a faster version.

Joyce even worked part-time at a bike shop during school and full-time once he graduated. A career in the military beckoned, and he joined the Irish Defense Forces. That didn't stop his passion for biking.

He continued to enjoy his rides and began to participate in adventure racing with his unit.

"But it was one day when I was out riding my mountain bike that life would change forever," he says.

Forging a new career after the accident

Riding out in the woods with adverse conditions, Joyce took a fall and broke his back, instantly leaving him paralyzed from the chest down.

"The pain was enormous, and I drifted in and out of consciousness a few times," he says. "I couldn't draw enough breath to shout for help. Luckily, my friend found me. After many hours, I got off the mountain and to the hospital."

Joyce needed to learn how to live a "new normal" since he could no longer perform his duties as a soldier. It was during his months of rehabilitation that he began to explore other career opportunities. "I saw the difficulties for those with disabilities and wondered if I could do something to solve those problems," he says.

At the age of 26, Joyce went back to school and studied industrial design at the Institute of Technology in Carlow in Ireland. At the end of his studies, he started a couple of small hardware-related startups. He then traveled to Shenzhen, China and worked at a hardware accelerator startup as head of design for eight years.

Pivoting to a different path—with a hint of the past - When COVID hit, Joyce's career took another turn. He returned to Ireland and began teaching remotely for New York University (NYU) Shanghai. "Hosting my classes online, I was able to teach Fusion to students on the other side of the planet," he says. "Two paths I was traveling at the same time were to converge in the near future, but not how I expected."

During this time, he found himself literally getting back on the bike—albeit with three wheels instead of two. His first bike was very rigid and simple. One day, his neighbor saw him on it and suggested some trails in the nearby Slieve Bloom mountains.

"We set off on a Saturday morning," Joyce says. "For the first time in 15 years, I rode down a mountain bike trail. It was terrifying and exhilarating at the same time. The adrenaline was fully flowing again, and the bug had well and truly bitten. I was back on the bike."

It wasn't long before Joyce was outriding the bike's capability. There were frequent failures, leading to numerous repairs. It was clear that the bike was not going to last very long. Mountain bikes can be pricey, but adaptive mountain bikes are "frighteningly expensive," Joyce says. There wasn't much of a choice in his mind. He needed to design his own bike for wheelchair users.

"Project Mjolnir encompasses so many things. It's about education and evolution. And, most importantly, it's about inclusion. It's about taking something that was out of reach and making it accessible to more people." -- Noel Joyce, Professor, New York University and Project Mjolnir

Developing Project Mjolnir prototype with Autodesk Fusion. Courtesy of Noel Joyce.

Taking on the design of an adaptive mountain bike with Fusion

With Fusion, Joyce designed an entirely new type of adaptive mountain bike. Not only that, he set ambitious goals for the most complex, full-suspension bike possible. He spent hundreds of hours in Fusion, working out problems, creating specific geometry based on the desired characteristics, and figuring out how it would be assembled. Project Mjolnir was born. The name itself is inspired from both Thor's hammer and the video game Halo.

"Giving the new bike a name seemed to solidify the direction," Joyce says. "For Project Mjolnir there were a few core tenets I wanted to stick to in its development. It needed to be customizable, affordable, and repairable. I also wanted the ability for it to be built anywhere. And it had to be evolutionary—always able to change."

Learning from past prototype failures, Joyce continued refining the design with the help of other NYU colleagues and outside vendors. In 2022, he traveled to New York to teach at NYU for a semester. While there, he was encouraged to apply for the VIP (vertically integrated projects) program at NYU Tandon School of Engineering. It includes multi-year, multidisciplinary projects for more than 1,000 students to get hands-on experience developing solutions to real-world problems. By using Fusion in this program, Project Mjolnir could move to the next level.

Project Mjolnir goes global - Throughout the entire design and development process, Fusion was central to landing a successful design. As Project Mjolnir grew, the benefits of Fusion and students' ability to instantly access files in the cloud were undeniable. Now, the project was in full development with plans to assemble bikes at three major NYU campuses: New York City, Shanghai, and Abu Dhabi

"We were able to give students access to the Fusion files before parts even arrived so they could use it like an instruction manual for the assembly," Joyce says. "They could become really familiar with it before they even put their hands on metal to build these bikes. This expedited the speed at which we were able to assemble the bikes. We went from the first one taking us three days to two days for the second."

Joyce, NYU staff, and the student teams set out a core objective to build four bikes at the three NYU campuses and in Ireland within the first year. They accomplished it in just under 10 months. They also hit another major milestone with the first adaptive mountain bike ride in New York City across the Brooklyn Bridge, followed by a ride on trails within the city not long after that.

Keeping the momentum going

With Fusion, the Project Mjolnir team is creating new modules for upgrades to the four bike examples already built. They are also releasing design files to the public for those wanting to build their own bike. According to Joyce, the hope is to build a community of riders, builders, and innovators and continue to develop the platform as an educational experience to learn about design and manufacturing.

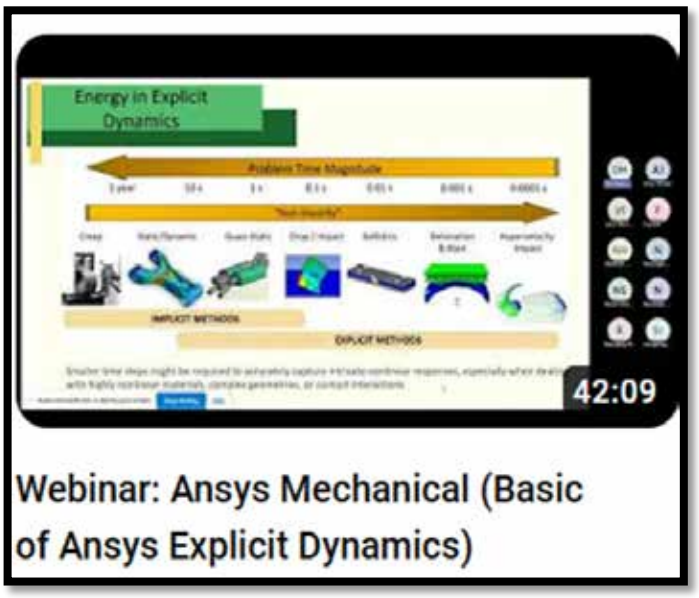
"Project Mjolnir encompasses so many things," Joyce says. "It's about education and evolution. And, most importantly, it's about inclusion. It's about taking something that was out of reach and making it accessible to more people. It is the pursuit of knowledge and development of empathy that will help students at NYU design and build for people in the future."

Get Fusion for the classroom
Autodesk offers free educational access to Fusion software, learning content, and other resources.

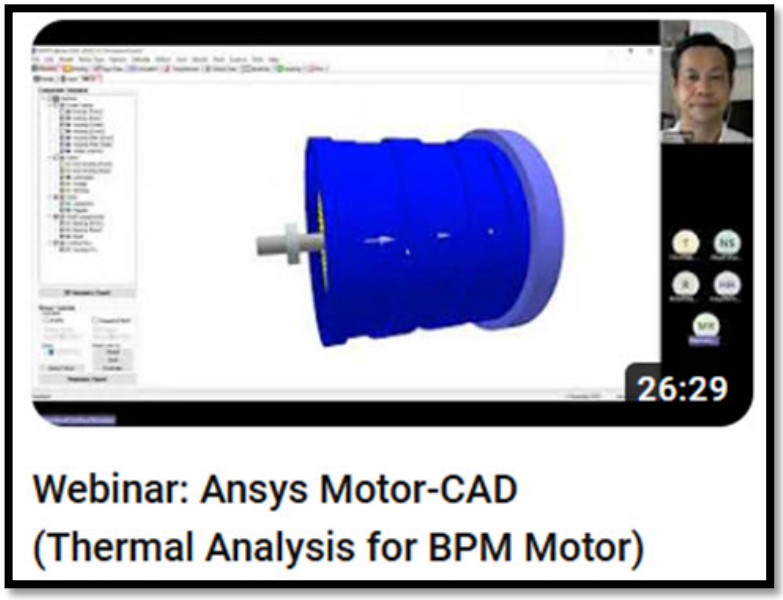
DFE-tech: We offer comprehensive software solutions that span the entire range of physics, providing access to virtually any field of engineering simulation that a design process requires.

If you have missed the below webinars join us on YouTube to view them.

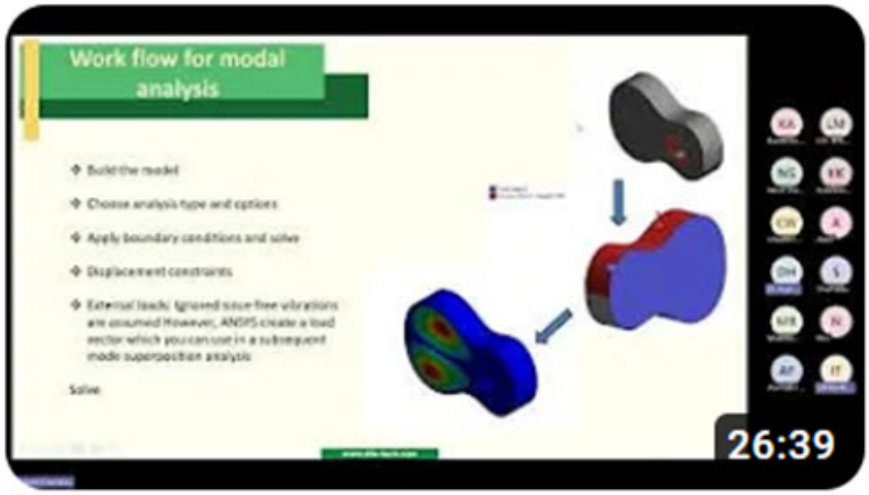
YouTube – [Webinars and videos]



Webinar: Ansys Mechanical (Basic of Ansys Explicit Dynamics)

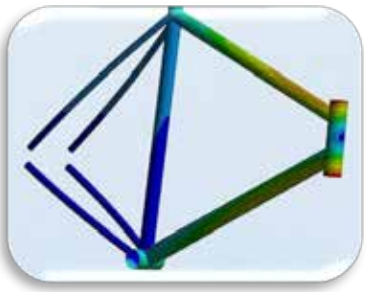


Webinar: Ansys Motor-CAD (Thermal Analysis for BPM Motor)



Webinar: Ansys Mechanical (Structural Modal Analysis)

CADFEM India: Great article by Christian Mayhofer - Carbon Fiber Lightness for Optimal Road Bike Frames - To achieve top performance in road cycling, the focus is increasingly on the perfect frame - lightweight, stiff, and aerodynamic. Learn in this article how Ansys ACP can assist engineers in optimizing the head tube stiffness of composite bicycle frames, enabling a weight reduction of 30% compared to aluminum frames.



Carbon Fiber Lightness for Optimal Road Bike Frames

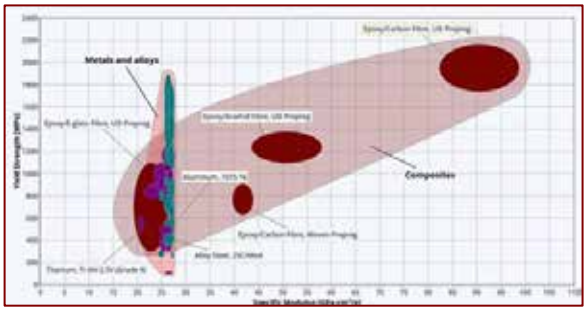
Author Christian Mayhofer

To optimally tackle the technological challenges of today, lightweight construction plays a crucial role. This is exemplified by the increased efficiency of airplanes, or on a smaller scale, maximizing personal achievements on a road bike. Whether a professional athlete or a hobby cyclist, who wouldn't want to save crucial seconds during challenging mountain stages?

In addition to essential rigorous training, a weight-optimized road bike frame can provide significant benefits. Efficient pedaling and agile maneuvering in curves not only require a reduction in weight but also a specific stiffness of the frame.

For performance road bike frames, essentially two materials are considered. Aluminum is taken into account due to its acceptable weight-to-stiffness ratio and its good design and manufacturability. However, it is surpassed by carbon fiber reinforced plastic (CFRP) for several reasons. The attached Ashby diagram from Ansys Granta Selector highlights the superior strength and excellent specific stiffness as significant advantages when compared to various lightweight materials. While aluminum is easier to manufacture, CFRP, by contrast, allows for precise adjustments of stiffness in local areas due to the fiber structure, making it more versatile.

In this article, a composite bicycle frame is specifically optimized for its head tube stiffness. Since manual calculations would be impossible in this case, Ansys tools are utilized, which assist engineers in handling the complexity of a layer setup and its determination. With the help of Ansys Composite PrePost (ACP), a manufacturing-oriented laminate is defined, which is then analyzed in Ansys Mechanical for its deformation behavior. Based on this, a parameter study is conducted to determine the optimal number of layers in 0°, 45°, and 90° directions, resulting in a 30% weight saving compared to aluminum.

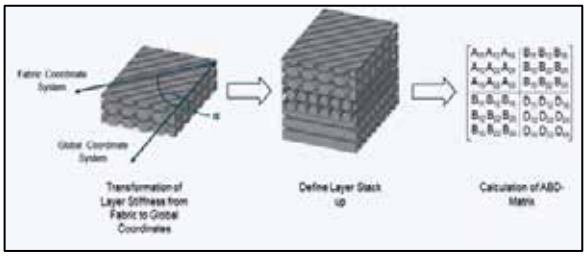


Ashby Diagram from Granta Selector 2024R1 | © CADFEM Austria GmbH

Composite Stiffness: From Single Ply to Laminate The fiber-reinforced plastics used in bicycle frame construction fundamentally consist of a composite of epoxy resin as the matrix and carbon fibers for the decisive stiffness and strength. These composite materials exhibit orthotropic material behavior, meaning they possess significantly higher mechanical properties in the fiber direction compared to directions perpendicular to the fiber orientation. To optimally utilize this characteristic and to ensure maximum stiffness, unidirectional (UD) layers are used, which orient the fibers exclusively in one direction.

In various areas of the frame, the orientation of UD layers can be flexibly adjusted to the respective loads. A 0° layer along the tube axis strengthens the bending stiffness and supports the laminate under tensile and compressive stresses. An orientation at 45° to the main direction counteracts shear stresses, while a 90° layer improves resistance against the collapse of the cross-section. Depending on the stress, the orientations of the layers and their number in the frame sections can vary, creating a flexible layer structure that significantly influences the mechanical properties.

The stiffness of a planar multi-layer composite can still be manually calculated. The stiffness of individual layers is transferred based on the fiber orientation into a global coordinate system. Afterward, using classical laminate theory, the so-called ABD matrix can be determined to describe the elastic behavior of the laminate. It consists of three submatrices, where the A matrix represents the in-plane stiffness.



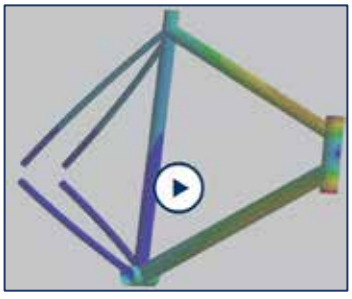
The D entries describe the resistance to bending or the plate stiffness, and the coupling stiffness matrix B provides information on whether there are couplings between in-plane and bending properties, such as shear as a result of bending, within the laminate.

ABD Matrix of a Planar Multi-Layer Composite | © CADFEM Austria GmbH

How do I define a composite in Ansys? The manual derivation of the stiffness characteristics of a laminate and their subsequent implementation via APDL into an FE calculation is, in principle, feasible – but honestly, for complex models like a bicycle frame, this would be an incredibly tedious endeavor. A far more efficient and user-friendly solution is offered by the software add-on Ansys Composite PrePost (ACP), integrated into the Workbench. This tool not only determines the mechanical properties of the laminate but also allows for the analysis of manufacturing-relevant effects, such as draping effects on highly curved surfaces.

The workflow begins with the creation of a shell mesh using the proven Ansys Mechanical features. Furthermore, the grouping of surfaces for possible individual layer definitions can be carried out using "Named Selections". Within ACP itself, all laminate-specific definitions are established. The range of possibilities extends from the definition of a "Fabric", which represents the used textile, through "Rosettes", which provide a solution if the fibers must follow a complex guideline, to "Oriented Selection Sets" for defining different laminate zones. Finally, the layers themselves are defined and structured under "Modeling Plies".

After defining the laminate and checking the manufacturing parameters in ACP, as shown in the video, a straightforward connection with a simulation block is made through simple drag-and-drop within the Workbench.



In addition to a conventional static calculation in Ansys Mechanical, the coupling also enables, among other things, a transfer to an explicit analysis in LS-DYNA.

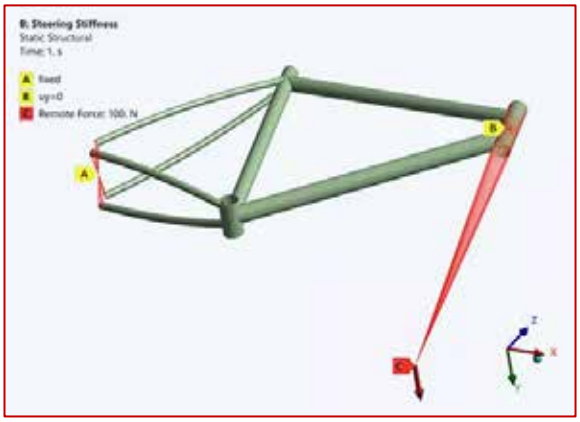
The connection of ACP with a simulation block results in the transfer of the laminate properties to the shell mesh of the analysis. After defining the simulation boundary conditions, the simulation model can be analyzed in the usual manner.

View the video on website

Head Tube Stiffness: Layer Configuration via Parametric Study Following this general overview, the insights gained are applied to the road bike frame model. Traditionally, the analysis of head tube stiffness is conducted through prototypes, but these are often too costly and time-consuming. For the simulation, the following boundary conditions are derived from the standardized test: The surfaces of the dropouts at the rear are fixed in all 6 spatial directions using a "Remote Displacement". Additionally, movement of the steerer tube center in the y-direction is suppressed, while a load of 100 N is applied through a "Remote Force" at a distance of 1000 mm at the ends of the steerer tube.

To narrow down the result space in the layer configuration design, clear design goals are essential. For the road bike frame, therefore, a minimum head tube stiffness of 90 Nm/° with a maximum weight of 1000 g is the stated goal. The stiffness is calculated based on the twisting around the center of the steerer tube and the torque resulting from the load, which corresponds to 100 Nm at this point. Thus, in addition to the simulation boundary conditions, the optimization goals of the subsequent parametric study are known, and only the layer configuration remains to be determined.

But how do you define a laminate when there are no prior experiences to draw from? A recommended starting point is the definition of a laminate with a symmetrical and balanced layer configuration. This minimizes coupling of loads and internal shear stresses between the layers. For the preliminary analysis of the frame in ACP, 5 layers of UD (unidirectional) fabric are chosen, with the orientation set at [0°/+45°/90°/-45°/0°]. The mid-plane of the laminate is at the 90° layer. As optimization parameters, the number of individual layers is defined, with the parameter space limited to 1 to 3 layers per orientation. An additional symmetry condition thus results in 27 different design variants.



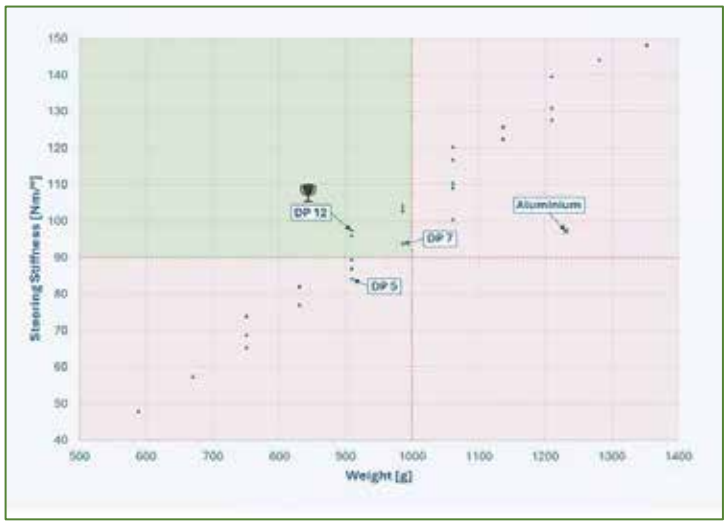
Boundary Conditions for Simulating Head Tube Stiffness | © CADFEM Austria GmbH
Initial Layer Configuration of the Frame for the Parametric Study | © CADFEM Austria GmbH

Ideal Layer Definition and Further Insights Using the integrated parameter set in the Workbench, the 27 design variants can be quickly generated, and the desired deformation values can be calculated in under 20 minutes. The evaluation is based on the diagram shown below. Only 5 design variants are located in the upper left quadrant (highlighted in green) and thus meet the requirement of 90 Nm/° head tube stiffness at a maximum weight of 1000 g. The variant DP12 shows the best ratio of stiffness to weight, with 97.58 Nm/° at only 908 g. In the parameter set, this variant's layer configuration is shown as [2x0°/2x+45°/90°/2x-45°/2x0°], totaling 9 layers.

The success of the layer configuration becomes evident when compared with an equivalent aluminum frame: The latter would have over 30% more weight at the same stiffness! The designs DP5 and DP7 from the diagram show additional remarkable insights. Despite having the same or even higher number of layers – as

is the case with DP7 – they exhibit lower head tube stiffness. These comparisons underline the importance of fiber orientation in relation to the load. While some of these aspects might be intuitively understood with experience, simulation with the help of Ansys ACP opens up an endless expansion of possibilities with minimal time investment.

Is variant DP12 the layer configuration to proceed with into manufacturing? Short and concise answer: No. The preliminary design provides a very good indication, but it must be considered that it was limited to one load case and ignored other criteria such as bottom bracket or rear triangle stiffness. A symmetry of the laminate of 〚["2x0°/+45°/-45°/" ("90°")‾]〛_S would additionally bring an improvement.



The same layer configuration across the entire frame represents another idealization. Ideally, the individual parts of the frame would have different layer configurations. These and other possible improvements can be included in the simulation.

Graphical Evaluation of the Parametric Study with Color Representation of the Design Goals | © CADFEM Austria GmbH

The Extra Mile: What Else is Possible? Analyzing the stiffness of composite components only covers half the ground. A comprehensive evaluation additionally requires the assessment of composite-specific failure criteria. Through the laminate definition in Ansys ACP, criteria according to Puck, Tsai-Wu, Hashin, and others, as well as sandwich criteria, for example, can be evaluated in Mechanical. Furthermore, the analysis allows for the assessment of the most stressed ply and the progression of the reserve factor across the laminate thickness.

Shell meshing reaches its limits when normal stresses in the thickness direction cannot be neglected, as can occur with impact loads on the rear assembly of a bicycle, for example. ACP allows for the discretization of the laminate with solid or special solid-shell elements to meet these challenges. Although ACP can evaluate interlaminar shear stresses of a shell model due to its specialized approach, solid modeling offers advantages for a more precise analysis. Subsequently, the selection of damage models such as First Ply Failure or Progressive Ply Failure is flexible.

Not enough? If you would like to discuss further possibilities of composite analysis in ACP, such as automation through Python or integration with Ansys optiSLang for comprehensive laminate optimization, please feel free to contact us. …

ALTAIR - EPA,"Heat waves are occurring three times more often than they did in the 1960s — about six per year compared with two per year. The average heat wave season is 49 days longer, and individual heat waves are lasting longer and becoming more intense. U.S. Environmental Protection Agency (EPA)"

Excerpts - Web - **Predicting Wildfire Danger - NSF NCAR's "Derecho" Supercomputer Forecasts Fire-Sparking Weather**

PDF available on the website

Their Challenge - Extreme weather events have always been an inevitable part of life for every species on Earth — and, due at least partly to climate change, they're both more frequent and more powerful today than they have been for all of human history. One of the most visible, destructive types of extreme weather events are wildfires. Wildfires often have a myriad of complex causes, but dry, hot conditions drastically increase the odds of powerful blazes.

According to the U.S. Environmental Protection Agency (EPA), "Heat waves are occurring three times more often than they did in the 1960s — about six per year compared with two per year. The average heat wave season is 49 days longer, and individual heat waves are lasting longer and becoming more intense." Scientists have been using data about recent fires in the Western United States, dividing the blazes into regions, correlating them with observations of atmospheric conditions, and simulating how those conditions will change using a set of advanced regional and global climate models, including simulations from the NSF NCAR Wyoming Supercomputing Center.

Our Solution - To forecast and prepare for the weather conditions that lead to fire danger, supercomputers like NSF NCAR's 19.87-petaflops Derecho system — and the vital software that keeps them running efficiently — are paramount. To facilitate their world-renowned research on these incredible machines, the team at NSF NCAR uses Altair PBS® Professional®, a fast, powerful workload manager that improves productivity, optimizes utilization and efficiency, and simplifies administration for clusters, clouds, and supercomputers. Weather and climate prediction involves an ever-changing host of complex variables, and Altair knows firsthand that modeling the Earth's weather and climate is a massive, important challenge that requires powerful HPC systems and software that can orchestrate the most demanding workloads. NSF NCAR chose Altair in part because of its long history of providing leading institutions with technology that ensures that climate modeling and simulation workloads run quickly and efficiently and maximize HPC resources.

Results - The work at NSF NCAR has far-reaching real-world impacts. The results of modeling wildfires on NSF NCAR supercomputers have shown a steady increase in fires across all regions of the western U.S., especially during more severe fire seasons, and have predicted that the duration of peak fire seasons will grow longer. Knowing what to expect in advance enables informed future planning and wildfire mitigation. In a world where extreme climate events such as wildfires are increasingly common, technology like Derecho — and related simulation and data analytics tools — are invaluable. Ultimately, supercomputers like Derecho and the software that powers them help to save land, lives, and ecosystems, and millions of dollars every year.

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CADFEM: From our website: **The furnaces of EBNER** are developed, among other things, for the heat treatment of semi-finished metal products (steel wires, strips, blanks). Due to the complex thermo-mechanical load, simulations were carried out, which took creep processes into account, in order to evaluate the life cycle prior to the production of a real prototype. Images: © EBNER

Fig 1 Figure 1: Industrial furnace from EBNER for heat treatment

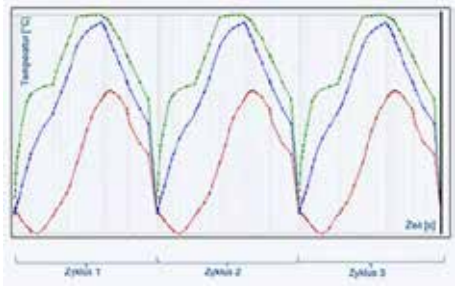


Figure 2: Temperature curve of all heating and cooling cycles and temperature curve on the support structure

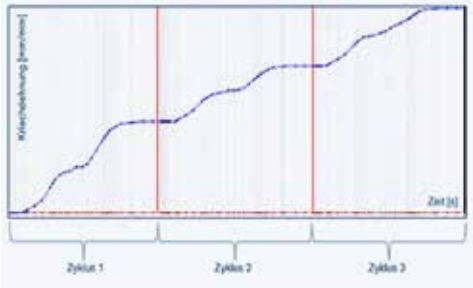


Fig 3 Figure 3: Calculated course of creep strain of all heating and cooling cycles and temperature course on the support structure

WEB – **Temperature-influenced thermo-mechanical life cycle analysis of a support structure**
Sector: Machinery & plant engineering, Steel & metal production
Specialist field: Heat Transfer, Structural mechanics

Task - The support structures for holding the semi-finished products in the furnaces are exposed to the high temperatures. As a result, creep processes can occur. These plastic (irreversible) deformations have a major influence on the life cycle of the support structures, especially in the case of extensive heat treatment processes with high temperature differences, which include cyclic heating and cooling processes lasting several hours. Due to the complex thermo-mechanical load, Ansys Mechanical was used to evaluate the life cycle prior to the production of a real prototype. The aim of the calculations was to determine the cyclic thermo-mechanical influence on the life cycle of the support structure based on the creep processes that occur.

Solution - **The calculation in Ansys Mechanical was performed using a one-way coupling of a temperature field and a structural analysis, taking into account three full thermal cycles (heating and cooling processes.** Due to the high thermal mass of the system and the occurrence of temperature jumps, a transient temperature field analysis was performed (see Fig. 2). The temporal changes of the state variables are also taken into account. A temperature curve generated from empirical values served as the energy input to the support structure and the semi-finished products. Thermal material properties were given as a function of temperature - the temperature jumps provide strongly fluctuating properties. Using mapping methods, the resulting inhomogeneous temperature fields were transferred to the static structural analysis in the second step. The transfer was performed in several load steps specifically at times of critical thermal gradients. In addition to the temperature-dependent stiffness properties, a creep law was also defined to model secondary creep effects using known creep and fracture tests. The cumulative creep strain over all three load cycles shown in Fig. 3 was now compared with the critical creep strain. From this, a maximum number of cycles could be calculated.

Excerpt: Customer Benefit - The options implemented in Ansys Workbench for taking creep processes into account, as well as the definition of temperature-dependent material properties and also the simple coupling options, form the basis for solving this problem. This results in considerable cost and time savings in the development of heat treatment furnaces...

Research Triangle Park (RTP) - Its 7,000 acres house hundreds of companies, including science and technology firms, government agencies, academic institutions, startups and nonprofits. RTP is located between the three anchor cities, which is the largest research park in the United States and home to numerous high-tech companies - Ozen Engineering is seeking a Mechanical Engineer

Experience: Using ANSYS LS-DYNA software tools.
Location: Research Triangle Park, Durham, NC.
Work Location: in person. **Hours**: Full-time - 8 hrs. Mon. to Fri

- Do you Demonstrate expert-level subject matter capabilities?
- Possess strong interpersonal presentation skills?
- Are you an enthusiastic learner who loves working with physics-based simulation technology?
- Are you interested in joining a rapidly growing Elite Ansys Channel partner team in a role with growth potential?
- Are you interested in applying your advanced engineering knowledge through pre-sales and post-sales engagements to enable client success using simulation tools?

If yes, contact OZEN Engineering for questions and to apply. hr@ozeninc.com – You may not check every box, or your experience may look different from what is outlined, but if you think you can bring value to Ozen Inc, we encourage you to apply.

Experience level: Minimum 3 year

Benefits:	401(k) & 401k matching	Vision insurance	Dental insurance
	Health insurance	Life insurance	Paid time off

Responsibilities: Serve as a subject matter expert on ANSYS tools and platforms, responding to client inquiries quickly and accurately.

- **Lead technical customer engagements** for Ansys software demonstrations, evaluations, technical support, and engineering consulting services.
- **Design and delive**r customized training and mentoring to assist clients with integrating simulation tools to meet engineering goals.
- **Work independently** within a multi-disciplinary team to deliver innovative solutions.
- **Collaborate** with sales account managers to execute technical engagements. Serve as a team player with a great customer facing attitude and the ability to develop long-standing customer relationships.
- **Create** proposals, blogs, videos, whitepapers and conference presentations on simulation applications.

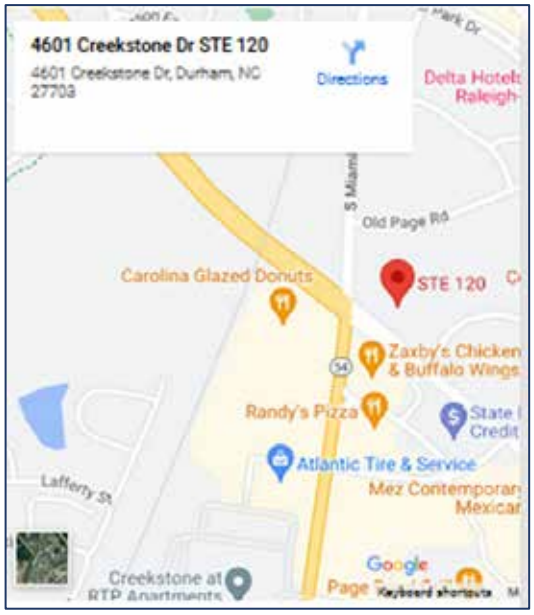
About OZEN: Ozen Engineering, Inc. is the premier distributor of advanced Computer Aided Engineering (CAE) software and an Elite Ansys Channel Partner. We are experts in simulation of structures, fluids, heat transfer, electromagnetics, optics and photonics. Prestigious companies turn to Ozen Engineering as a primary source of reliable simulation solutions. We are passionate about providing accurate and advanced simulation technologies to help clients realize unparalleled results using Finite Element Analysis (FEA), Computational Fluid Dynamics (CFD), and Electromagnetics (EM) software tools from ANSYS.

Requirements: Candidates for positions with Ozen Engineering Inc. must be legally authorized to work in the United States. This candidate must meet US ITAR regulations.

Mechanical Engineering degree or similar discipline with emphasis on physics-based simulation	At least 2 years of direct full-time experience using Ansys tools & Expert level experience using LS-DYNA	High-level attention to detail in documentation & workflow protocols.Highly organized, self-driven with outstanding interpersonal skills.
Ability to quickly and independently learn complex engineering skills / concepts / software tools. Confidence to teach the same material to a group of engineers with short turnaround time.	Excellent written & verbal communication skills. Strong presentation abilities.	Have a passion for engineering and physics-based simulation and possess strong problem-solving skills
Verification of employment eligibility will be required at the time of hire.	Visa sponsorship is not available for this position.	To conform to U.S. Government regulations on International Traffic in Arms Regulations (ITAR), this candidate must be a U.S. citizen or Green Card holder.

Application Questions:

- Do you possess US citizenship or a Green Card?
- What level of expertise can you demonstrate during an interview using Ansys LS-DYNA simulation tools - Beginner, Intermediate, Advanced, Expert?
- In your most-recent 6 months of industry experience, on average how many hours per week did you spend providing physics-based modeling and simulation solutions using Ansys LS-DYNA?



Why relocate to Durham: Durham is part of the Research Triangle Region, known for its technology and scholarly institutions. Durham is both family oriented and technology based.

Web - **Durham Public Schools** shares information about their district that will provide you with quick access to some of the materials you may need to aid in your relocation decision.

A great place for a Mechanical Engineer with deep experience using ANSYS LS-DYNA to relocate

OASYS: Did you know that Arup worked extensively with London EV Company (LEVC) to reengineer their iconic TX taxis for the 21st century? If not, it's time to check out our case study!

Software used on this project:
LS-DYNA, PRIMER, 3PLOT, T/HIS, REPORTER

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Web - **The Role of LS-DYNA® in the Design of the New London Electric Taxi**

This partnership allowed LEVC to develop their advanced electric vehicle, meeting tight deadlines and stringent safety standards by:

- Tapping into Arup's expertise in automotive CAE analysis for EV, including structural safety, durability, NVH and more
- Eliminating downtime by leveraging Arup's global presence
- Maximising efficiency through a 'one-solver' approach using LS-DYNA and the Oasys LS-DYNA Environment.

The challenge - In 2014, the call for greener, more sustainable alternatives to city transport had led to the Mayor of London's plans to gradually phase-out traditional combustion driven taxis. Specifically, starting from January 2018, no new diesel taxis would be granted vehicle licenses, and all new registered taxis must be zero-emissions capable.

For the London Electric Vehicle Company (LEVC), manufacturers of the iconic TX taxi series, this was an opportunity to re-engineer the London Taxi for the 21st century. Firstly, it would need to undergo a radical architectural redesign, from its material to its overall structure to properly house an electric powertrain. Secondly, the vehicle's safety features would need to be lifted to the highest standards, to ensure the protection of the driver, passengers, and vulnerable road users (VRUs) in the city comprising pedestrians, cyclists, and powered two-wheelers. Finally, despite significant part differences from its predecessors, the vehicle was to retain the distinctive design features that gave the TX series its popularity.

With an ambitious launch date of early 2018, the TX electric taxi's development programme time frame was short. Designs had to be finalised with limited prototype testing and in conjunction with the construction of a new manufacturing facility. To meet this deadline and stringent requirements, LEVC had to find additional resources and expertise that could help accelerate the design process

The solution - Given the limited rounds of prototype testing available, the use of Computer-Aided Engineering (CAE) was crucial as it provided accurate and reliable predictions to guide the design process from the earliest concept stages. LEVC enlisted Arup's team of automotive CAE specialists to provide all structural safety simulations and to support the development of the vehicle's adhesively bonded body structure. Additionally, Arup was also responsible for conducting analysis on:

- Occupant and pedestrian safety
- Strength and durability
- Noise Vibration and Harshness
- Closures
- Interior and exterior systems

LS-DYNA was the primary analysis package used due to its flexibility to solve a range of linear and non-linear problems, as well as the modularity of its keyword file structure. This single-solver approach created a streamlined process that provided considerable time benefits as all load-cases drew from the same set of LS-DYNA include files. This eliminated the time-consuming need to convert large models into other formats and reduced the risk of information loss during the process.

The Arup team created a workflow, enabled by the Oasys LS-DYNA Environment, to efficiently construct and analyse the many simulation models required to support the design programme.

Oasys PRIMER, a pre-processor fully compatible with all LS-DYNA keywords, provided a safe environment in which to create and manage models. The include file manager was used to easily combine the vehicle systems required for each load case, from analysis of the bare structural frame through to a crash analysis of the entire vehicle complete with crash test dummies. PRIMER's specialist tools aided connection management, model numbering and pedestrian mark-up with comprehensive keyword support. Model modifications could be made in confidence and verified with the powerful error checking function before submission.

Following LS-DYNA execution, the results extraction and report creation processes were accelerated using the post-processing software suite. Oasys D3PLOT enabled the team to visualise their analysis results and inspect specific parts of the model, while Oasys T/HIS allowed manipulation of data via mathematical functions, industry standard filters, and specialist functions for calculating injury criteria in automotive impact analysis. Lastly, in-built templates in Oasys REPORTER automated repetitive tasks, leaving the engineers more time for decision making.

Arup's global team provided high value benefits for the development programme. Split between the UK and Shanghai, the engineers were able to directly support LEVC by sitting client-side in their design studio whilst leveraging the time difference to reduce the downtime on analysis and other urgent tasks. This setup also allowed Arup to utilise the depth of their automotive CAE experience and computing infrastructure.

The results - By partnering with Arup and the Oasys LS-DYNA Environment for their CAE needs, LEVC were able to refine and develop their iconic vehicle design to meet tight deadlines and stringent safety standards, including Transport for London's (TfL) Conditions of Fitness. Production for the new EV taxi began in late 2017 and was officially introduced to service the city in January 2018, marking the start of a new era for black cabs and the evolution of sustainable city transport.

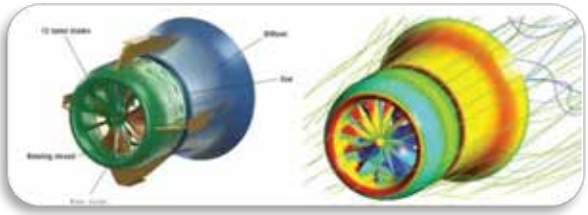
"The specialist team at Arup and the Oasys LS-DYNA Environment software supported LEVC to meet the ambitious deadline for our vehicle. More than half of London's entire black cab fleet is now zero emission capable because of our electric TX taxi, which continues to play a vital role in providing green and accessible mobility solutions for all." - Chris McCoy, Technical Director at LEVC.

Presented at the 15th International LS-DYNA Conference

Web – **The Role of LS-DYNA® in the Design of the New London Electric Taxi**

James Dennis, Simon Hart -
ARUP (Advanced Technology and Research)

OZEN Engineering: Don't miss the article by G. Ibarra, "Tidal energy is a form of renewable energy generated from the movement of ocean tides, and tidal turbines harness this energy to generate electricity. These turbines are similar to wind turbines, but instead of using wind, they utilize the power of ocean currents… By using CFD, engineers can simulate various operating conditions and evaluate the impact of different factors."



Web - Discover the techniques applied to tidal turbines through the use of Computational Fluid Dynamics (CFD). By: German Ibarra

Understanding Tidal Energy and Turbines - Tidal energy is a form of renewable energy generated from the movement of ocean tides, and tidal turbines harness this energy to generate electricity. These turbines are similar to wind turbines, but instead of using wind, they utilize the power of ocean currents. The predictability of tidal currents and ocean streams implies that underwater power stations could contribute to the base load power supply, generating energy consistently. This presents a notable advantage compared to other unreliable or sporadic renewable energy options.

Researchers and engineers need to study the behavior of tidal currents, the impact of turbines on the marine environment, and the overall performance of the turbines to optimize their design and operation. Currently, there are different projects around the world in various stages of development. Some of the most important projects are mentioned by the OES (Ocean Energy Systems) in the document '2023 Tidal Current Energy Developments Highlights'.

- MeyGen, 6 MW up to 34 MW (north of Scotland)
- Nova Innovation Tidal Array, 600 kW up to 1.5 MW (Shetland, Scotland)
- Verdant Power, 210 MWh generated (New York's East River, USA)
- Sustainable Marine Energy, 420 kW up to 1.26 MW (Nova Scotia, Canada)
- Orbital Marine Power, 2 MW (The European Marine Energy Centre, United Kingdom)

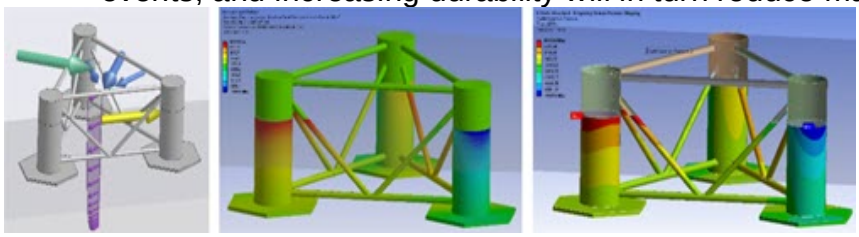
Importance of R&D - In addition to tapping into wind and solar energy, capturing the immense kinetic energy found in the Earth's tidal currents, ocean currents, and river flows represents one of the most encouraging prospects for renewable energy sources. However, these types of devices are still expensive as they face the challenge of cost-effectiveness. According to the International Energy Agency (IEA), ocean power generation in the NetZero Scenario 2000-2030 requires an energy generation of 27 TWh by 2023, but it only reached 1.6 TWh in 2020.

In general, R&D must be focused on the mitigation of flow separation and drag and include optimization to avoid trial and error. The study of Fluid-Structure Interaction (FSI) and new materials is also needed to increase the lifecycle. Moreover, R&D helps in understanding the environmental impact of tidal turbines and finding ways to minimize their effects on marine ecosystems. It also allows for the exploration of innovative approaches and solutions to overcome the challenges faced in tidal turbine deployment and operation.
Role of Computational Fluid Dynamics

Computational Fluid Dynamics (CFD) is a powerful tool used in the design and optimization of ThermoFluid systems and Turbomachines. By using CFD, engineers can simulate various operating conditions and evaluate the impact of different factors. In general, engineers pursue crucial information for designing robust, reliable, and cost-effective tidal turbine systems.

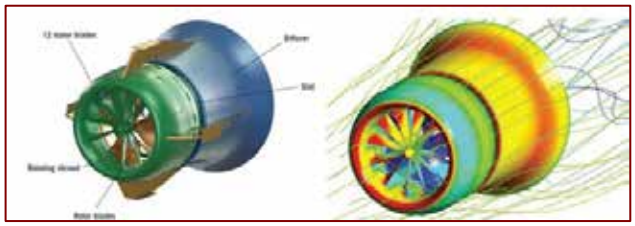
Therefore, CFD capabilities include,

- Simulate and analyze the flow of water around the turbine blades, predicting their performance and efficiency. Optimize the blade shape, size, and orientation.
- Include the effects of water depth, turbulence, and sediment transport, on the performance of tidal turbines.
- Maximize net energy output and peak power generation while maintaining highest degree of safety.
- Address challenges that are unique to tidal applications and explore environmental impacts for design of high-capacity, durable tidal turbines.
- - Ensure structural integrity of the turbines can be optimized for both operating conditions and extreme events, and increasing durability will in turn reduce maintenance and replacement costs.



Ultimately, investing in R&D for tidal turbines is important for the growth of the renewable energy sector and the transition towards a more sustainable and clean energy future. The future of tidal turbine technology looks promising, with CFD playing a significant role in its development. As computational power and modeling techniques continue to advance, the accuracy and speed of CFD simulations will improve, enabling more detailed and reliable predictions of turbine performance.

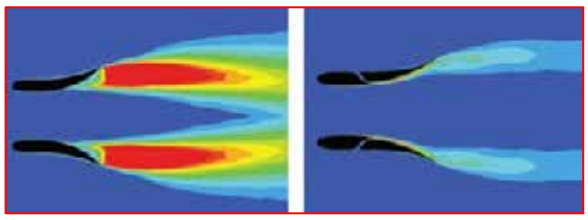
Success Case - An earlier generation of experimental marine power generators used a shrouded propeller with blades that were supported only where they connect to the shaft. However, resulting stresses on the blades led to failures, and the search for solutions has resulted in the use of expensive materials. Gilmore Engineers Pty Ltd was contracted to optimize the design of a new generation of tidal current power generators in which the outer diameter of the rotor blades is connected to the shroud to reduce those stresses on the blades. Below are outlined the most important points.



(CAD model of the marine power generator and the CFD results (Pressure on the surface of the power generator with velocity streamlines).

CFD: Technology capabilities - Engineers then simulated the blades in steady-state mode using the Ansys CFD frozen rotor model to connect the rotating components to the optimized shroud design.

- Ansys CFD software was used to simulate about 30 sizes and shapes of the shroud in a week, focusing on the diffusor or draft tube region, to determine the design that provided the lowest pressure while maintaining flow attachment to the wall.
- Further analysis was then performed on the best-performing shapes by varying the size, shape and number of slots and taking into account production costs.
- Results: Design improvements - The design optimized by CFD generated 3,892 W, an improvement of nearly 150% over the initial design.
- The complete design optimization took 96% less time than would have been required using the build-and-test method.



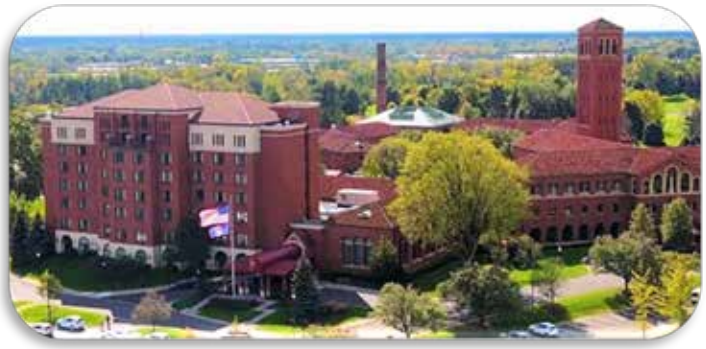
The initial design of this tidal current power generator was limited because it produced so much turbulent kinetic energy (left). Using Ansys CFD, engineers optimized the final design to generate power much more efficiently (right).

The 2024 International LS-DYNA Conference.

October 22-23 in Plymouth, Michigan.

All LS-DYNA users are invited to submit a paper.
We look forward to your contributions.

All LS-DYNA Users plan to meet in Plymouth, Michigan. Submit your paper



Saint Johns' Resort - 44045 Five Mile Rd
Plymouth, MI 48170

An iconic landmark surrounded by natural beauty on our 200 acres

- All LS-DYNA users can contribute to the agenda with a paper from their areas of interest and expertise.
- Full technical papers are highly recommended.
- Submit your proposal, and we will notify approved presenters of the next steps.

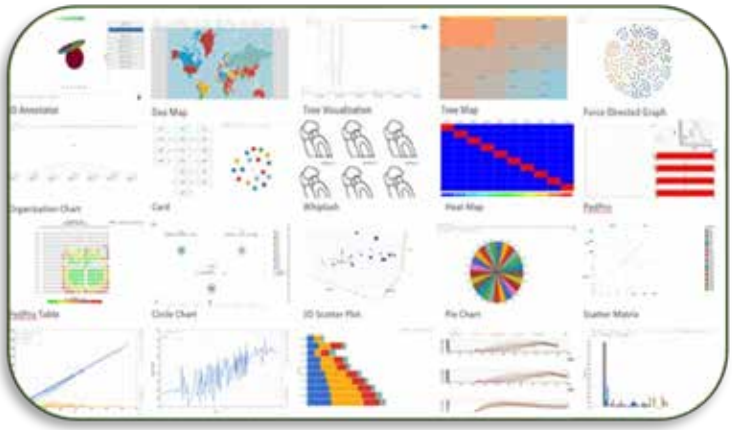
Key Dates and Deadlines

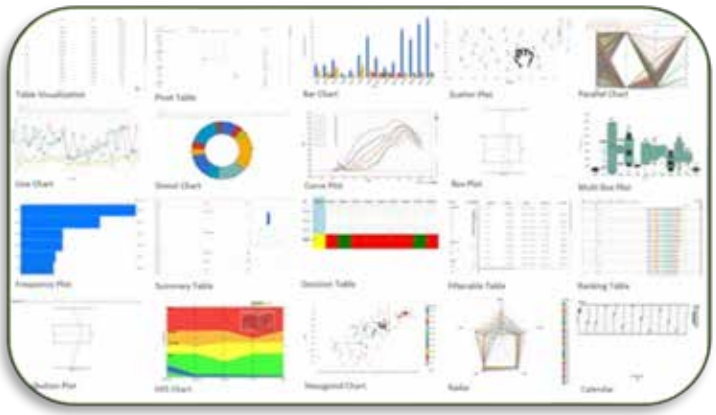
- Initial Proposal Deadline | May 31, 2024
- Paper Acceptance Notification | July 1, 2024
- Final Paper & Presentation Due | September 31, 2024
- 2024 International LS-DYNA User Conference | October 22 - 23, 2024

Additional Presenter Information

- Submissions will be reviewed and approved according to the following criteria: Technical innovation, scientific rigor, relevance to LS-DYNA community, meaningful conclusions and more.
- All papers will need to be accompanied by a presentation.
- Presenters will be assigned to a 30-minute timeslot:
  - 20 minutes for presenting
  - 5-10 minutes for Q&A.
- Recorded presentations may be considered if you are unable to attend in-person.

D3View - **Visualizers are data-driven**, which means every aspect of the data such as the line thickness, line width, line color are driven by data. This allows data to be presented in a variety of different ways associated with data to uncover hidden information.





d3VIEW

Visualizers are also connected where each visualizer can communicate with other visualizers. As an example, one visualizer can be used to highlight certain aspects of the data and this is communicated to other visualizers.

Sharing the visualizers does not mean we lose the interactivity. Sharing in d3VIEW allows full interactivity to further explore the data.

d3VIEW is a comprehensive platform that helps interpret your data

provides rich library of data-driven visualizers to explore and gain insights from data.

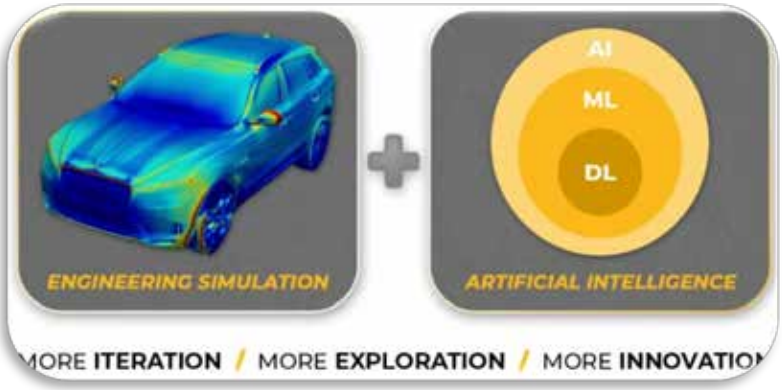
Simlytiks unites exploring, sharing and analyzing data into one application.

It uses extensive visualization tools to hone in on specifics, trends, patterns or just the most important aspects of large or small datasets.

Because of this, Simlytiks creates stories from your data, so you can understand what is working and what needs improvement.

Mazen El Hout, Product Manager, Safe Systems Team, Ansys

"Since the mid-20th century, scientists and engineers have tested, validated, and improved their designs with the help of simulation. With every model, simulation software generated synthetic data — millions of calculations about what works and what doesn't. Today, artificial intelligence (AI) is combining these learnings with real-time insights to fill in the gaps of what's possible, making simulation faster and more accessible than ever before."



The Intersection of AI and Simulation Technology

Artificial intelligence combined with simulation promises real benefits for engineering

What are the Benefits of Combining AI and Simulation?

Design and development were once limited by the speed and accuracy of individual engineers running simulations by hand. Modeling complex systems took a lot of time and expertise that could delay progress. Today, AI-enhanced simulations speed up design and optimization across industries, especially those in which accuracy and efficiency are critical, such as automotive, aerospace, electronics, and materials science.

AI enables democratization of simulation to a wider engineering audience

AI-enhanced simulations are:

- **Faster**: AI can analyze past simulations to quickly identify complex patterns while incorporating new information to vet relationships within the data.
- **Easier to use**: AI can democratize the use of simulation by making it more accessible to nonexperts through user-friendly web-based applications.
- **More comprehensive**: AI simulations enable the integration of multiple models to provide thorough representations of complex systems.
- **Continually improving**: The iterative engineering process enabled by AI and simulation enables engineers to improve their designs with less constraints.

How Training AI Enables Fast Predictions

For AI to work, it needs to be smart. Data simulation is widely used to train AI across topics.

Simulation data is pulled from past simulations and fed into the AI system based on the area of interest. For example, if the AI is learning about integrated circuits, the user would load performance results of circuit boards into the software.

Generative AI applied to 3D physics leverages previously generated simulation results from physics-based solvers to train the AI models and deliver faster predictions. An important advancement of data-driven approaches compared to existing reduced-order modeling (ROM) approaches is that engineers don't need to parametrize their geometries to build the AI model. As a result, the performance predictions can be done across design changes, even when the geometry structure is inconsistent.

During the simulation process, design variants of a geometry are fed to the AI, and prediction of physics performance are almost instantaneous. This makes design iteration, exploration, and optimization much more efficient and accessible to a wider engineering audience, such as designers, system engineers, and methods and tools specialists.

Traditional physics-based solving methods can also be used to validate selected best designs with full fidelity simulation.

The Future of AI and Simulation - The mutually beneficial relationship between AI and simulation will continue to increase efficiency for engineers and designers. As the two technologies become more prolific across industries and applications, their broad adoption beyond engineering will further accelerate human advancement.

Ansys SimAI leverages past data to predict performance of new designs

As more people unlock the power of prediction by combining these powerful tools, the possibilities will expand exponentially.

An example of the combination of AI and simulation is a recent addition to the Ansys product family. Ansys SimAI is a machine learning platform for engineers who want to rapidly explore and predict the performance of new concepts across design phases. SimAI provides reliable and fast results and is accessible through a user-friendly cloud-native application.

Goengineer Ryck Hoopes, Hardware Application Engineer

"Consider for a moment what options are available to food manufacturers or restauranteurs to showcase their products... Thankfully, today's 3D scanning technology opens up a new avenue to producing high-quality digital food models, with full-color high-resolution 3D printers able to bring them into physical reality."

Scan-to-Print Workflow: Tips to Optimize 3D Printed Food Models - Article by Ryck Hoopes

Consider for a moment what options are available to food manufacturers or restauranteurs to showcase their products. Mesh modeling software programs allow designers to sculpt, shadow, and texture 3D models, but it's a time-consuming process and the finished models may not accurately reflect reality. Some companies offer injection molded mock food models, but they too often lack the appearance and realism required by customers.

Thankfully, today's 3D scanning technology opens up a new avenue to producing high-quality digital food models, with full-color high-resolution 3D printers able to bring them into physical reality.

It Starts with Quality Scanned Data - The first step in developing a 3D printed part is to acquire high-quality image data of the object. The quality of the image data directly affects the efficiency of the workflow process and the realism of the final product. Therefore, choosing the correct 3D scanner is critical.

Although laser scanners have high accuracy, portable white light 3D scanners, like the **Creaform Go!SCAN Spark**, can quickly capture high-quality shapes, colors, and textures and then generate a watertight mesh file that can be effortlessly sent to a 3D printer. This helps eliminate a lot of post-image processing and time-consuming texture mapping to prepare models to print.

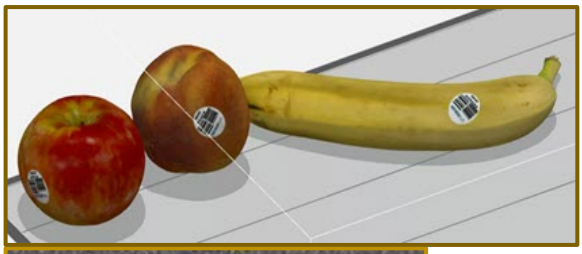
Scan reconstruction parameters directly affect image quality, so proper settings must be in place to optimize the data used for 3D modeling. For example, shutter speed resolution and accuracy enhancements should be used when scanning multiple colored objects. Strategic acquisition techniques and workflow should be adopted to optimize the entire workflow and final printed object.

Preparation - The preparation process is also critical for acquiring a quality scan. The main purpose of planning and preparing is to save time by eliminating failed attempts or insufficient mesh data. Once the areas of interest and difficult features have been identified, the food item must be fixed in place. This means tricky components like toppings or sauces must not change mid-scan, as this will lead to significant misalignment.

A useful tip is to freeze an object before scanning it. For example, having the cheese frozen on a cheeseburger allows the user to scan the top side and then flip it over to scan the bottom side without the cheese sagging or changing shape.

Understanding if the mesh file should be multiple entities or a single body is also important to clarify. Experienced technicians usually have insights into other tricks such as spacers to allow light to capture overhanging areas that are hard to capture. Once acquisition is complete, the point cloud graphic body will be constructed of triangles in various sizes and shapes. The file will need to be decimated, cleaned, texture mapped, and have optimized color for printing. This process must be carefully monitored to avoid inadvertently changing the model. Once the model is finalized, the point cloud will be converted to a mesh body that is watertight and ready to print.

Export the model as an .OBJ file with linked .MTL (material library) and a .JPG that has full-color texture. Now the file is ready to be sent to slicing software, like GrabCAD Print, allowing us to view/modify layers, estimate material usage, and print times.



Printing Accurate and Realistic Models - Selecting the correct 3D printing material to represent the realistic texture and feel is also important. Companies like Stratasys offer an industrial line of full-color PolyJet 3D printers like the J850 or J55 that will facilitate impressive food models such as the banana (shown below) that was printed using Stratasys full-color Agilus30 that provides a very realistic look and squishy feel.

Leveraging knowledgeable partners like GoEngineer will help you choose the best part orientation, materials, and printers as well as ensuring your printers are properly maintained for optimal performance accuracy and repeatability.

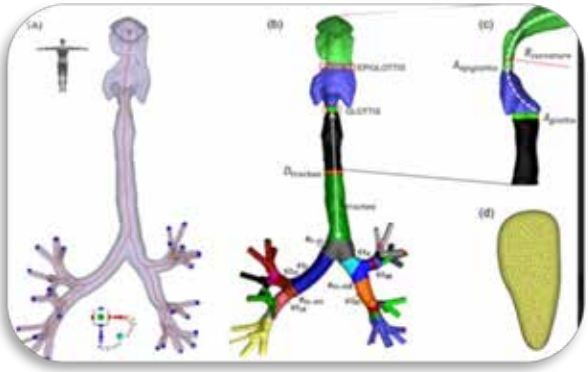
In conclusion, using modern digital tools such as Creaform handheld 3D scanners makes the scan-to-print process significantly faster and easier. Having the ability to scan the 3D printed part and do an overlay comparison to the original scanned object gives confidence that the models are built accurately.

Interested in learning more? Please contact us for more information about 3D scanning technology & applications.

Goengineer Ryck Hoopes, Hardware Application Engineer - With a background in domestic and international manufacturing, he brings extensive knowledge of R&D, quality control, and supply chain management. Having worked in Aerospace, Healthcare, Marine, and Consumer Goods industries, Ryck is well versed in common challenges many companies face today. When he's not working, Ryck enjoys mountain biking, snowboarding, and spending time with his friends and family in the mountains. He also coaches little league football, baseball, and snowboarding.

RBF Morph – EXCERPT - The study unveils a revolutionary parametric 3D model of the human respiratory tract. This model is designed for particle drug delivery and deposition, presenting a significant leap forward in personalized therapeutic strategies for respiratory conditions, such as asthma and chronic obstructive pulmonary disease (COPD). For the air phase, the system of equations were numerically solved by using the finite-volume approach in ANSYS Fluent v. 221.

This breakthrough research not only provides a deeper understanding of the intricate dynamics within the human respiratory tract but also paves the way for more personalized and effective treatment strategies for patients suffering from respiratory conditions.



WEB – MDPI - **A Parametric 3D Model of Human Airways for Particle Drug Delivery and Deposition**

L. Geronzi, B. Fanni, B. De Jong, G. Roest, S. Kenjeres, S. Celi, M.E. Biancolini

- RBF Morph, Monte Compatri, Rome, Italy
- Dept. of Enterprise Engineering “Mario Lucertini”, Univ. of Rome Tor Vergata, Rome, Italy
- BioCardioLab, Bioengineering Unit, Fondazione Toscana G. Monasterio, Massa, Italy
- ONE Simulations, 2312 Leiden, The Netherlands
- Grep IT, 2211 Noordwijkerhout, The Netherlands
- Dept. of Chemical Engin., Faculty of Applied Sci., Delft Univ. of Tech., The Netherlands

Abstract - The treatment for asthma and chronic obstructive pulmonary disease relies on forced inhalation of drug particles. Their distribution is essential for maximizing the outcomes. Patient-specific computational fluid dynamics (CFD) simulations can be used to optimize these therapies. In this regard, this study focuses on creating a parametric model of the human respiratory tract from which synthetic anatomies for particle deposition analysis through CFD simulation could be derived. A baseline geometry up to the fourth generation of bronchioles was extracted from a CT dataset. Radial basis function (RBF) mesh morphing acting on a dedicated tree structure was used to modify this baseline mesh, extracting 1000 synthetic anatomies. A total of 26 geometrical parameters affecting branch lengths, angles, and diameters were controlled. Morphed models underwent CFD simulations to analyze airflow and particle dynamics. Mesh morphing was crucial in generating high-quality computational grids, with 96% of the synthetic database being immediately suitable for accurate CFD simulations. Variations in wall shear stress, particle accretion rate, and turbulent kinetic energy across different anatomies highlighted the impact of the anatomical shape on drug delivery and deposition. The study successfully demonstrates the potential of tree-structure-based RBF mesh morphing in generating parametric airways for drug delivery studies.

Introduction - The exploration of particle deposition in human airways is of paramount importance in advancing the comprehension of aerosol treatment efficacy [1]. The administration of medical drugs via inhalation stands as a prevalent therapeutic approach for managing widespread respiratory conditions such as asthma and chronic obstructive pulmonary disease (COPD) [2,3,4]. However, the complex and variable anatomy of human airways, coupled with the substantial inter-patient morphological variation, significantly

contributes to the complexity of particle trajectories during inhalation [5,6]. Despite the potential therapeutic benefits of aerosolized drug delivery, the variability in particle trajectories within the complex architecture of human airways often results in suboptimal drug deposition [5,7]. This non-optimal distribution can lead to unmanaged symptoms and disease progression in patients with respiratory conditions. In this regard, a comprehensive understanding of these phenomena is crucial for tailor-made inhalation therapies to individual patient characteristics, ensuring optimal drug deposition and, consequently, enhanced treatment outcomes [8,9,10].

To unravel the complex fluid dynamics phenomena that govern the transport and deposition of particles in the airways for accurately estimating the regional dose, numerical models have emerged as a powerful solution [11,12,13]. In this regard, computational fluid dynamics (CFD) stands out as a key numerical tool, offering a versatile approach to analyze and simulate complex airflow patterns within the human respiratory system [14,15,16,17]. In the last decade, different authors have exploited numerical tools to model the human airways [18,19,20,21,22,23]. Several studies explored the capabilities of CFD models as a tool to investigate lung injuries [24,25,26] as well as to optimize drug deposition in human airways [22,23,27,28,29,30]. However, the numerical analysis of drug delivery in the respiratory system involves not only the challenges of particle deposition modeling but also considerations of the inherent complexity and time-consuming nature of CFD studies [31,32]. Conducting detailed CFD simulations of patient-specific anatomies is a multifaceted process, encompassing the detailed variations in airway morphology and physiological parameters. In fact, the highly variable and complex anatomy of human airways introduces significant challenges in accurately modeling the airflow and particle trajectories [33,34,35]. Each individual's airway geometry can highly influence how and where particles deposit, making generalizations difficult. Then, the physical characteristics of the particles themselves, such as size, shape, and density add another layer of complexity [11,36]. These characteristics directly affect the particles' behavior in the airway flow, influencing factors like inertial impaction, sedimentation, and diffusion. Moreover, the dynamic nature of breathing patterns, encompassing varying flow rates, further complicates predictive modeling. This variability can lead to differing deposition patterns even under similar conditions and must necessarily be accounted for when simulating these phenomena. Moreover, the time-consuming nature of these simulations poses a significant limitation, particularly in urgent clinical cases where timely decision-making is critical. These complexities necessitate sophisticated modeling approaches and make the prediction of particle deposition challenging for respiratory drug delivery studies. In this complex scenario, CFD analyses for particle deposition could benefit from the implementation of mesh morphing techniques to adapt a baseline patient-specific geometry to a wide range of anatomically different models based on the variation of selected morphological parameters, thus significantly reducing computational costs. The importance of using morphing techniques to parameterize the geometry related to anatomical models enabling systematic and controlled shape variation for patient-specific analyses and sensitivity studies is discussed in [37]. In particular, radial basis function (RBF) mesh morphing was already exploited to enhance the CFD modeling and simulation in the cardiovascular field [38,39,40,41,42].

In this context, our study focused on addressing the challenges previously described by deriving a parametric model of the human respiratory tract capable of generating new synthetic patient-specific geometries on which the representation of the airflow and the particle deposition of the drug could be derived. In this work, we aimed to translate the solution efficacy of RBF mesh morphing to control the shape and size of the upper part and the first three generations of the respiratory tract. In particular, we started with a patient-specific

anatomy that we used as baseline geometry to represent different human airways. The mesh of the respiratory tract was created, and its surface portion was subdivided into multiple regions. In order to control each portion of the model, the respiratory tract from the mouth to the fourth generation was described by a set of geometrical parameters. These geometrical parameters consisted of bend radius, diameters, areas, bifurcation angles, and branch lengths. A novel approach based on a specific radial basis functions mesh morphing algorithm acting on the surface computational grid, restructured into a tree-like framework, was implemented to artificially vary the anatomy up to the third generation. It acts recurrently, adapting each part of the parametric model at every iteration according to the provided input parameters. The airflow and particle parameters most relevant for calculating flow patterns and drug deposition in the human respiratory system were identified. These include particle diameter, flow rate, and injection velocity. The most occurring ranges of shape and physical parameters were determined. A total of 1000 different configurations of the input parameters were created. The quality of the grid for each new synthetic patient was checked, and CFD simulations for particle deposition were conducted.

2. Materials and Methods

2.1. Baseline Geometry and Centerline Extraction

A CT dataset of a subject volunteer (male, 47 years old) was selected to extract the three-dimensional geometry of the human airways. The dataset was already used in other studies [18,23]. The images were segmented using thresholding methods [43] and then manually refined to obtain the anatomy of interest. The entire human respiratory system comprises 23 generations of airway branches. Asgari et al. [44] conducted a study on the deposition of aerosol microparticles in a realistic lung model spanning from the mouth to the sixth-generation bronchioles. Their findings indicated that aerosol deposition in the case of micron-sized particles predominantly occurs in the superior regions of the airways. For these reasons, in this work, only the upper and central parts of the respiratory tract have been considered, and the segmentation was performed up to the fourth generation of bronchioles, as shown in Figure 1a. To ensure a fully developed flow in the outflow zones, the last segments of the bronchial branches were elongated into pipes of uniform cross-section for a length of 4 times the diameter. Subsequently, the centerline of the model was extracted using VMTK [45] through Voronoi diagrams [46] after automatic detection of the inlet and outlet seed points. The extracted centerline was represented by a set of splines controlled by known points. At the inlets and outlets, the geometry was specifically cut to have a flat surface perpendicular to the centerline, suitable for setting the inflow and outflow boundary conditions of the CFD model. The parameter related to the diameter of each tract was extracted using the same approach proposed in [47]. Briefly, 100 cutting planes perpendicular to the centerline were obtained on each branch. For each branch, 8 segments joining two portions of the perimeter were drawn passing through the center of the plane (i.e., the intersection point of the centerline). ... Continued on MDPI

LivGemini Is a MedTech Company Created to Support Clinicians in Evaluating Patients with Cardiovascular Diseases. Using model order reduction techniques, we are able to rapidly evaluate critical clinical outcomes in timeframes compatible with the medical needs.

LivGemini

In more complex cases, we can easely set up numerical computations on HPC resources and deliver the computed results. Proudly Partnered with University Hospitals of Rennes, Dijon and Toulouse in France & Policlinico Tor Vergata, Rome in Italy.

Our network is growing every day!

Our Approach - The name LivGemini derives from 'Living Gemini' and alludes to the concept of 'Digital Twin'. We propose innovative and alternative approaches in the biomedical field, specifically focusing on creating solutions based on Digital Twin technologies for cardiovascular applications.

Our Mission - We want to revolutionize the healthcare industry by providing cutting-edge tools for the accurate diagnosis, personalized treatment and continuous monitoring of cardiovascular diseases such as the aortic aneurysm.

Our Vision - Our priority is to build solutions bringing benefits to both the physician for diagnosis and the patient for safety. We envision a future where medical interventions are optimized, preventive care is enhanced and patient well-being is prioritized through the seamless integration of technology and medicine.

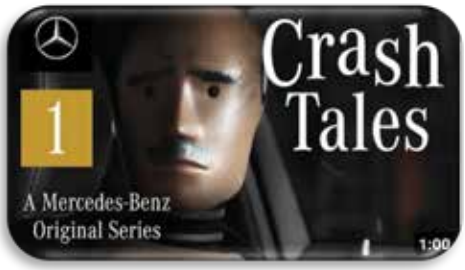
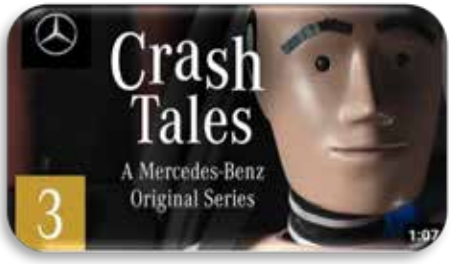
Leonardo Geronzi, Founder, CEO - Leonardo Geronzi is a biomedical engineer and an Early-Stage Researcher involved in the ITN-EID H2020 project "Medical Digital Twins for aneurysm prevention and treatment" MeDiTATe. He had professional experiences with software companies like Ansys and RBF Morph. He has been working for about 5 years in the field of cardiovascular numerical simulation.

Marco Evangelos Biancolini, Founder - Marco Evangelos Biancolini is associate professor of Machine Design at the University of Rome "Tor Vergata" and founder of the RBF Morph, already established company in the field of CAE modelling and simulation. He is currently Principal investigator of the 4 years ITN-EID H2020 project "Medical Digital Twins for aneurysm prevention and treatment" MeDiTATe.

Mercedes-Benz - YouTube
CRASH TALES are hosted by Tommy & Fred, two crash test dummies at Mercedes Benz.

"Crash Tales"

Mercedes-Benz Original Series, starring Tommy and Fred

	**Episode 1** Fred and Tommy have a dream job: they get to drive Mercedes-Benz every day. There's one downside, though – It's only for two seconds.
	**Episode 2 Mid-life Crises** Do you sometimes feel like you've hit a brick wall at the end of a workday? Fred and Tommy do. They're crash test dummies.
	**Episode 3: Moustache** For the sake of safety, our crash test dummies Fred and Tommy are used to taking rough hits. But recently, they've started hearing voices!
	**Crash Tales – Episode 4: Hard rock** Fred and Tommy love crashes. But this time, they give a new meaning to the term "headbanging".

US Airforce Picture of the Month

HILL AIR FORCE BASE, Utah

Capt. Melanie Kluesner, F-35A Lightning II Demonstration Team pilot and commander, taxis off the runway after being certified on her aerial demonstration by the 388th Wing commander at Hill Air Force Base, Utah, Feb. 22, 2024. Upon wing commander certification, the F-35 Demo Team pilot is required to complete the Air Combat Command Heritage Flight Training Course.

(U.S. Air Force photo by Staff Sgt. Kaitlyn Ergish)

Maiden flight - Air Force Research Laboratory's **XQ-67A Off Board Sensing Station**, designed and built by General Atomics, took its maiden flight Feb. 28, 2024, from Gray Butte Field Airport in Palmdale, Calif. The XQ-67A, the first of a second generation of autonomous collaborative platforms, completed several test points and safely recovered on the first of a series of flight tests.

(Courtesy photo)

A welcome upgrade - **An MH-139A Grey Wolf**, the replacement for the UH-1N Huey, prepares to land at Malmstrom Air Force Base, Mont., March 5, 2024. The MH-139A provides the ability to cruise 50% faster and farther than the UH-1N Huey helicopters while also having a 30% larger cabin and the capability to lift 5,000 pounds more.

(U.S. Air Force photo by Senior Airman Breanna Christopher Volkmar)

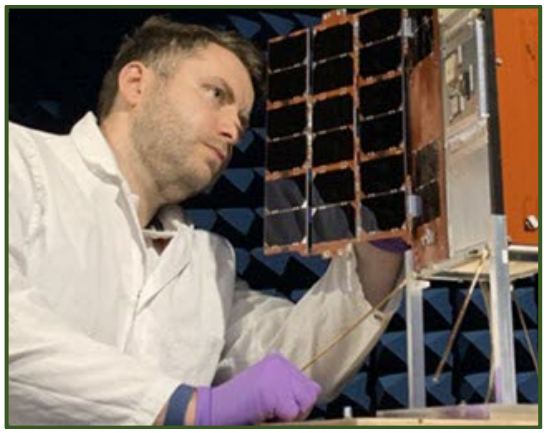
Web - **Baykar integrating more weapons on Akinci**

The Baykar Bayraktar Akıncı unmanned aerial vehicle (UAV) is carrying out firing trials with versions of the Roketsan MAM-L and MAM-T guided bombs that can be used against targets concealed by cloud cover

Web-Eielson AFB - 354th SFS K-9 unit demonstration

U.S. Air Force Staff Sgt. Alex Petkovic, 354th Security Forces Squadron military working dog handler, poses with Kefe, 354th SFS military working dog, during a demonstration at Eielson Air Force Base, Alaska, Feb. 27, 2024. Military working dogs are trained in apprehension, detection and search-and-rescue to protect Airmen and their families.

(U.S. Air Force photo by Airman Spencer Hanson)



UK's first space degree apprenticeship launched

BAE Systems and the University of Portsmouth have launched the UK's first ever degree apprenticeship in Space Systems Engineering, who will be part of exciting projects such as Azalea, which is due to launch its first multi-sensor low earth orbit satellite cluster in 2025 to deliver intelligence in real-time to military customers.

Apprentices will learn on-the-job critical skills at BAE Systems sites in Alton and Guildford, including System and Mission Analysis, Software Development, AOCS (Attitude and Orbit Control System) and Electronics from some of the most talented people in the industry.

True Story Time with Alan Nichols

I hope to reach at least one person who prepares for the "Next Event." The Community Emergency Response Teams all over America have the same task of being Public Information Officers when "we get the stage." **History does repeat itself, so I continue to write true stories to promote Emergency Preparedness. October 17th will be the 35th Anniversary of the 1989 Loma Prieta 6.9 Earthquake.**

I was one of well over 130 Hayward Police Officers working through it to keep our hometown safe on that terrible afternoon and throughout that very long and dark night. Every day, people sharing a common situation come together to help each other, while a few can still panic. You have to be ready for anything.

Join me on my journey as I share a 16-hour day working through a local disaster as a local First Responder.

How long did the Loma Prieta earthquake last? The earthquake struck just after 5:00 pm PST. It only lasted approximately 15 seconds but had a magnitude of 6.9. Its epicenter was in the Forest of Nisene Marks State Park, near Loma Prieta peak in the Santa Cruz mountains, northeast of Santa Cruz and approximately 60 miles (100 km) south of San Francisco.

When I felt the Earthquake - On October 17th, 1989, I got off work early from my construction job in S.F. to get ready for the 89' World Series ballgame. I picked up my daughter from her first-grade class at 4 pm. We lived at C and Foothill, in a two-story rental house built around 1884, next to the I.D.E.S Hall. My five-year-old daughter Sara and I were in the upstairs kitchen, and a plastic bowl of her penny collection vibrated westward out and off the window sill and fell on the ground below. All by itself. We both went downstairs and outside to pick up her pennies, and we had the bowl half full when I felt the BIG one around five or so.

My Reactions: I grabbed my daughter, Sara, in my arms and dumped her bowl of pennies as I pulled her away from our old two-story house. I backed as far away from that old house as possible, pressing my back into the cyclone fence of the I.D.E.S. Hall property line. The old house was all redwood, and so were those long wooden rain gutters two stories up. One of those huge redwood gutter sections fell off the eves and right down on Sara's pile of pennies under the window. It would have hit both of us.

I shut off the gas before I went back into the house alone: I had a wrench strapped to the gas meter. Shutting off the breaker box was next on my list. I went in to get the phone with the 25-foot cord; I could then run it out the window to my daughter.

I grabbed my Hayward PD uniform, my bug-out bag with my gear, my daughter's juice, and a doll. We waited outside in my work truck. My wife was the Cosmetics Manager for Longs Drugs on Mission by 238, a long drive without street lights. She made it home. I set her up in the house, making sure she had her lanterns and our Coleman camping stuff. I left her my Pistol Team bag to protect her and our five-year-old daughter from opportunists.

The Squad Rooms: I drove into the Hayward Police Station, as did over 50 other volunteers in the Reserve Officer program; we are 'Force Multipliers' to the existing Police Officers on the street. Both squad rooms were packed. We were each issued one radio, one more radio battery, and a flashlight with D batteries since the rechargeable flashlights went first. We left the Station in cars packed with a mix of Regulars and Reserves, five Officers, and five boxes of flares. In Hayward, there was no difference when you rode with a Regular; we were all on a first-name basis.

Take Up Position: Dispatch had us on channel three (COM 3,) and I soon heard my badge number on the radio as we were driving south on Mission: "R729, take up a position on Tennyson west of the BART tracks. The local neighbors called to say that the four-way intersection was dangerous."

When I was dropped off alone, it was busy, and no signals were working up and down Tennyson. I broke out my new box of flares on the northwest corner of the front lawn, and I set up my flare pattern as fast as I could.

When I had my blind intersection lit up, I went back to my new box of flares again, and I set up a second set of unlit flares, taking off the plastic safety cap and sitting each one on the unlit end of the flares that I had already lit in the street. It is called daisy-chaining, so my original 20-minute flares already had the next 20-minute flare set up to light itself. When we do that in advance, we can watch traffic more and kick an unused flare into one that is about to burn out. Tennyson at the BART tracks was not a flat street. There is an underpass under the Bay Area Rapid Transit tracks, and I could hear the high RPMs on a westbound car coming up from under the BART tracks in my direction.

Then it happened: I had just exited the street when a vehicle came into my view. The vehicle 'caught air,' and the driver lost control, going about 40 mph *Dukes of Hazzard* style, causing sparks everywhere when it came down hard on the pavement between us. The driver ended up partially regaining control of the car, driving across the lawn of the northwest corner house and dragging my almost new box of flares westbound on Tennyson. The flares were stuck under his car. I wasn't worried; I had set up those additional unlit daisy-chained flares on the street, so I still had about half an hour of flares lying on the street to direct traffic. Most cars slowed down for my flare patterns and drove to their homes on my cross streets. The local neighbors were extremely helpful; they joined me at the intersection with flashlights, even though some neighbors had family members trapped in the commute mess.

Everything changed when the sun finally went down: Not everyone was in control, and some panicked people used Tennyson to get off Mission, which was a very dark shortcut. They took out all but 11 of my lit flares in 20 minutes. I was piecing the pieces together. With their flashlights on now, I asked some of the neighbors to walk down the sidewalk under the BART overpass and try to slow down the drivers speeding in the dark and hitting the blind intersection that I was standing in at 40 miles an hour.

Good Neighbors: The neighbors were trying to help me. My few flares remained, so they brought me flares from the trunks of their cars. And they kept coming into the middle of my intersection. Other neighbors pieced together what flares they recovered from my original crushed box. They went fifty yards down the street behind me to collect the flares the first car dragged away when it took out my full box when I first set up on the neighbor's lawn. I was down to a very weak flare pattern, and the non-neighborhood cars were making it dangerous for me to be out there; I was losing the battle to control that dark intersection. I was yelling for the neighbors to stay out of the street and to stop trying to help me with the traffic control, as they kept me from watching for incoming airborne cars. One brave man yelled, "We are just trying to help you." I yelled as professionally as possible, "I'm trained to do this, and I'm not safe out here."

My Back-Up Arrives: I had lived in the Bonaire neighborhood of San Leandro, and we were right under the flight paths for the Alameda Naval Air Station and the Oakland Army Base. I knew Huey's and other rotor blade configurations and the low whoop-whoop that a Huey helicopter flying close to the ground sounds like. **My backup support turned out to be a BART helicopter with a big spotlight checking the train rails for damage, which lit up my intersection so bright that every car saw me, and I got the intersection quickly back together. With my team of neighbors to help.**

The call from Dispatch: Then I got a call from Dispatch saying that the Fire Department wanted an assessment of my intersection, & they wanted to pull me off & move me further west up Tennyson toward Huntwood.

I told Dispatch, “I need flares as soon as possible, and if I left the intersection, the neighbors would be directing traffic because they still have family out there.” In a few minutes, a couple of roving units brought me five or six flares each, and they called members of the local Police Explorers Organization to get me a few more boxes for my intersection. While I was waiting for my flare delivery, I lost another flare pattern to a car that fishtailed through it and drove westbound behind me.

Com 3 Dispatcher: “R729, the Fire Department requests that you turn around when possible and look westbound on Tennyson. I looked, and Dispatch said, “Every car that gets by you drives over the fire hoses behind you.” About two hundred yards behind me, the red lights from the Hayward Fire trucks lit up that intersection; there were no blue lights on any vehicle by the Fire Trucks. The cars snuck between the other Officer a quarter mile west of me..

Just when I turned around to greet the next set of hastily approaching lights coming into my intersection, the truck with the local Police Explorers and my flares showed up, and they parked in the middle of the intersection. We set up the grandfather-of-all-flare-patterns unloading an entire case of flares to make it; the Police Explorers can direct traffic, too.

Reassigned: - A brand-new Reserve Officer just out of the Reserve Academy Program also drove up. He told me, “You are being reassigned, take my unit.” Dispatch specifically sent me directly to the Fire Trucks because I was assigned to Reserve Academy Training. Before this earthquake, I taught Traffic Controls at multiple intersections simultaneously with the new Reserve Academy Cadets in the industrial tract at night for training. I also grabbed three cases of flares.

I set up another case of flares out around my unit, blocking the fire hoses on the street, which worked for about ten minutes. A car got through the last intersection, from which I was relieved, and the fast RPMs headed at my new flare patterns around the firehoses in the street. Steve says, “Grab a flare; they had enough warning.” We started de-capping flares (pulling off the safety covers) and lighting four or five at once in our hands, and he said, “Start throwing them into the traffic lanes.”

Our version of un-safe and insane. When we got the speeding cars under control at our flare pattern around the hoses, we heard another car bust through the last intersection that I was at. I stayed until the fire was out, and then I just followed the subsequent fires that they reported until morning broke and helped us all out. We finished about 7 a.m. the following day, as Public Works took over the intersections with cones and barricades since we had daybreak coming.

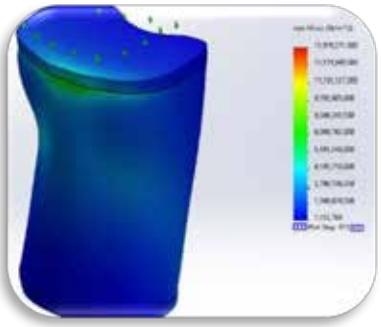
I was walking by a room with an open door in the Station, and a television was on Japan TV. Their crew was in San Francisco during the earthquake. Many Americans of Japanese heritage watch TV from Japan, not basic local TV channels like we watch daily. The channel from Japan was telling the Americans of Japanese heritage in California to call 911 if they needed help.

New Assignments: About 25 of us were awaiting new Assignments in the Reserve squad room, and Jerry White, our Reserve Coordinator, came into the room to address us. “Oakland PD is requesting any available Reserve they can get to help them with the thieves stealing from the victims still trapped inside their crushed cars inside what is left of the Cypress structure. You will also be protecting the ladders.” We stayed together in the squad room for an hour as we worked out back-and-forth logistics and who had family that they needed to take care of…

It was a long night and I was glad to head home: PG&E was checking a meter down the street, so I asked him while still in uniform: “Would you please check my house for gas? I have been on duty for 16 hours straight, and I could use a shower.”

If you are looking for something to do in your spare time and the Police Reserves are a bit above your level of volunteering, please look into your local Community Emergency Response Team, CERT.

Excerpts - **Using the "Solidworks" software, we conducted a comprehensive analysis that yielded valuable information regarding the biomechanics and behavior of the lumbar vertebrae.** When combined with experimental data, this information allows a greater understanding of the function of the canine's lumbar vertebrae, the resistance of the vertebrae to loads, and the likelihood of fracture.



MDPI WEB - Finite Element Model of Canine-Specific Vertebrae Incorporating Biomechanical Tissue Nonlinearity

E.Kostenko, Jakov Šengaut, Nikolaj Višniakov, Algirdas Maknickas

- Dept. of Veterinary, Faculty of Agrotechnologies, Vilniaus Kolegija/Higher Ed. Inst., Lithuania
- Dept of Biomechanical Eng., Vilnius Gediminas Tech. Univ., Lithuania
- Jakov's Veterinary Centre, Lithuania
- Inst. of Mechanical Science, Vilnius Gediminas Tech. Univ., Lithuania

Von Mises stresses obtained from the nonlinear dynamic dog vertebra model study

Abstract - As dogs are considered valuable members of many families, ensuring their health and well-being is essential. This study introduces a numerical nonlinear model that explores the complexities of canine vertebrae, with a specific focus on their experimentally observed mechanical properties. The model underwent rigorous testing, and its results were compared with actual data on the compression of canine lumbar vertebrae. The numerical results and experimental data comparison had a 12% RRMSE. This research enhances our understanding of canine bone health and lays the groundwork for future initiatives aimed at treating and mitigating bone-related diseases in dogs.

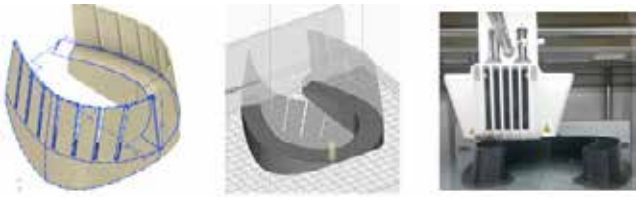
Introduction - We studied dogs because they play an important role in people's lives [1], and their health is important. Dogs are now studied not only in the laboratory animal context but also with the same consideration as humans in terms of clinical research. According to [2], in 2013, there were over 700 million dogs worldwide. We believe that research into diseases affecting canines should be conducted in the same manner as human research. Our focus on canine bone health stems from dogs' importance in human lives and the need for in-depth research paralleling human clinical studies. This research underpins the development of a detailed numerical model to understand and evaluate bone disorders in canines.

Dogs can suffer from osteopenia, and other metabolic bone disorders can affect humans as well as dogs [3]. Dogs are at risk of developing pathological fractures in their bones as a result of steroidal anti-inflammatory drugs [4]. There are additional metabolic disorders such as hyperparathyroidism and kidney disease [5], which also make a dog's bone tissue more fragile.

...Fractures are common in dogs [9], and the risk of a fracture occurring or recurring in the future must be evaluated in addition to the secondary cause of the fracture—for example, osteoporosis. Treating fractures becomes complicated when dogs have bone conditions like osteoporosis. For example, in 2022, Marshall and his team pointed out that, after surgery, dogs often limp or, in severe cases, might even need an amputation [10]. This shows how complex it can be to manage fractures in dogs, especially if they have other bone problems…

Engineering software & physics are an integral part of all horse activities

Hoof and leg problems in racehorses can cause serious injuries and decrease their value. Although therapeutic shoeing using special horseshoes can increase the effectiveness of veterinary care, it is labor-intensive and burdensome for farriers…The mechanical properties of 3D printed plastics for use as horseshoes remain unclear… In this study, special horseshoes were manufactured via 3D printing, and their dimensional accuracy, manufacturing time, and cost were evaluated.



MDPI WEB - [Degradation Behavior of Glue-On Three-Dimensional Printed Plastic Horseshoes in Equine Stables]

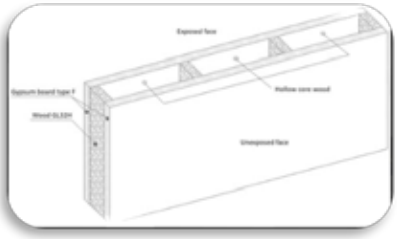
Y. Nakagawa, K. Yoshida, D. Kaneko
Nat'l Inst. of Tech., Asahikawa College, Asahikawa, Japan
S. Ikeda
Japan Blood Horse Breeders' Assoc., Shinhidaka, Japan

Abstract - A three-dimensional (3D) printed horseshoe fabricated by additive manufacturing has high design flexibility for use in special horseshoes. However, the mechanical properties of 3D printed plastics for use as horseshoes remain unclear. In this study, a proposed 3D printed plastic was subjected to degradation tests under the simulated equine growth environment, and changes in strength during the period of use were investigated. It was found that the strength of polylactic acid and polycarbonate, which are commonly used for 3D printing, was not significantly affected by the environment.

Introduction - **Horseshoes are mainly shoed on racehorses to protect their hooves. Horseshoes are made by a farrier who forges a steel or aluminum alloy bar to fit each hoof. However, the ageing of farriers and shortage of workers in the near future are concerns in this field. Although off-the-shelf horseshoes made by press-forming or machining are often used, modifications by farriers are still needed to conform to the hoof shape.** Lightweight soft-plastic horseshoes are also used for shock relief and treatment of hoof injuries. Plastic horseshoes are standardized industrial products with standardized sizes. Compared to general metal horseshoes, polyurethane, which is the most common material used for plastic horseshoes, is more difficult to modify during post-processing, posing difficulties in fitting into the hoof shape. Therefore, it is necessary to shape the hoof to fit into plastic horseshoes instead of normal hoof trimming. Another problem is the increasing cost of plastic horseshoes, which are more expensive than aluminum alloy horseshoes. Moreover, steel plates and wires are embedded within polyurethane horseshoes to improve their abrasion resistance, which is lower than that of metal horseshoes. Mischler and Hofmann [1] studied the wear behavior of commercial plastic horseshoes made of two polyurethane materials with different hardness values.

High loads, impact forces, and small repetitive loads acting on the horse's limbs and hooves are major causes of injury. Horseshoeing for the purpose of shock mitigation and injury treatment is referred to as therapeutic shoeing [2]. There are several types of special horseshoes, such as roller-motion and rail shoes to promote breakover, and egg-bar horseshoes to distribute load and control sinking of the heel. The type of specialty horseshoe should be appropriately selected according to disease type. The effects of horseshoeing on the limbs and hooves of horses have been examined mechanically…. However, the movements of the hoof-heel of metal horseshoes are restricted because the adhesive is applied to the entire hoof surface to prevent the shoe from being thrown, thereby negatively affecting hoof movements [6]. Hoof movement includes the deformation of the hoof during landing and serves an important function for the horse as it reduces landing shock and promotes blood flow, similar to a pump. The effect of horseshoeing on hoof movement has been studied by hoof-displacement-measurement experiments and finite element simulations…

ANSYS Program was used "...To satisfy the nonlinear conditions of the problem, the ANSYS® program uses the Newton–Raphson iterative method, with a convergence criterion based on the heat flow with a tolerance equal to 0.9, and other variables being considered as standard parameters. At the end of the thermal analysis, the temperature evolution is obtained…In this work, a numerical method was used to determine the temperature evolution in hollow core wood elements under fire. The analysis uses a thermal and transient nonlinear material algorithm with three different finite elements."



Web - MDPI - **Temperature Evolution inside Hollow Core Wood Elements and Fire Resistance**

Domingos Pereirs, Elza M.M Fonseca, Miquel Osorio

· ISEP, Instituto Politécnico do Porto, R. Dr. António Bernardino de Almeida, Porto, Portugal

Wall partition in wood and gypsum board materials, with one side exposed to fire

Abstract - **The present study is focused on wall panels exposed to fire**, with the construction building elements we used being made of wood and gypsum board materials. This type of configuration forms hollow core wood due to the constructive process. The aim is to present a numerical study to approach the calculation of the temperature inside hollow core wood elements and measure their fire resistance. The temperature evolution inside the cavities will be obtained with recourses to obtain the heat effect by convection and radiation through the wall elements. A numerical model, previously validated by the authors, will be used to carry out this process. The methodology includes the use of the finite element method in thermal and transient analysis with nonlinear materials to calculate temperature. To measure the fire resistance of the constructive model, the thermal insulation criterion, defined by the EN 1363-1:2020 standard, will be applied. Different results will be presented to discuss and ensure the verification of these fire-resistant elements.

Introduction - Buildings constructed with wood are becoming more prevalent worldwide due to the sustainability opportunities for wood construction and the general aesthetics of a wood building [1]. Wall panels with hollow wood core as lightweight elements are available for many applications [1,2]. Due to hollow core's high thermal mass, storing, and releasing heat, it maintains the ability to efficiently transfer large amounts of heat. The hollow wood core is a cavity within the component in use that offers some design flexibility. Another important factor is that hollow core wall panels have some advantages in relation to environmental impact in order to maintain sustainability and environmental friendliness, such as a reduced amount of cement and water required for production; no need for on-site storage space; minimal debris and site disturbance; and reduced labor, material, and waste.

Fire-resistance rating is the period, in minutes, for which the constructive element maintains the ability to confine a fire, to continue to perform a given structural function, or both, as determined by tests, or methods based on them, or more generally the time at which the failure of the element occurs [3]. It is defined by measuring the ability of a passive fire protection material to resist a standard fire resistance test. It comprises the time during which three criteria are satisfied: structural adequacy (ability to maintain stability and adequate load-bearing capacity), integrity (ability to resist the passage of flames and hot gases), and insulation (ability to maintain a temperature over the whole of the unexposed surface below that specified) [3,4,5,6]. With the increasing use of wood structures in construction engineering, more designers and engineers require information on detailed specifications and compliance with codes and regulations. There is still no complete certainty about the requirements or necessary details, namely focusing on the design of the structure in accidental situations and the calculation of fire resistance.

16th Int'l LS-DYNA Users Conference - Road traffic accidents are the eighth leading cause of death worldwide, killing 1.35 million annually. **The Global Human Body Model Consortium (GHBMC)** has previously created and validated a finite element model of a 50th percentile male pedestrian in LS-DYNA® to investigate vehicle-pedestrian impacts.

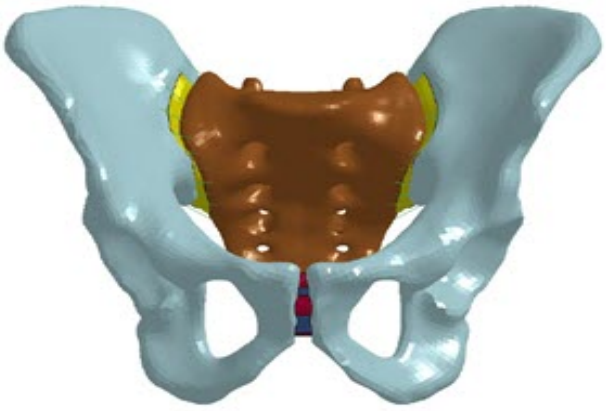


Figure 1. GHBMC pelvis model rendered in LS-PrePost®

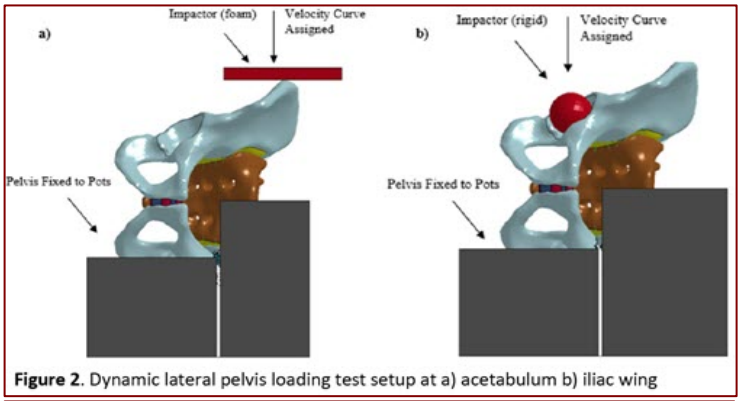
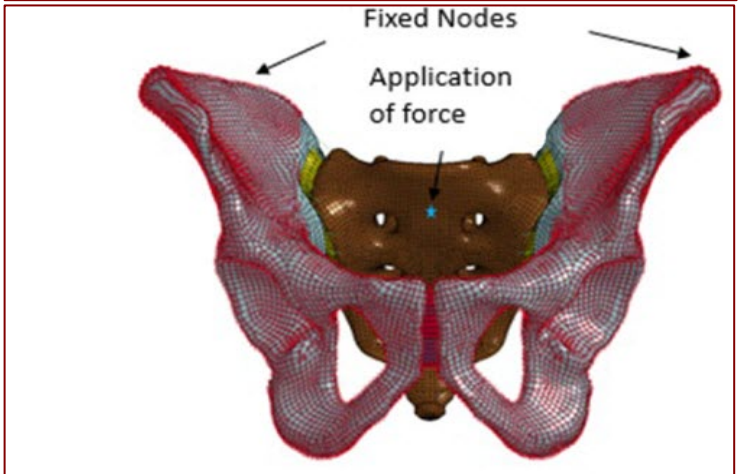


Figure 2. Dynamic lateral pelvis loading test setup at a) acetabulum b) iliac wing



Quasi-static sacroiliac joint displacement test set-up

Excerpt WEB - **Further Validation of the Global Human Body Model Consortium 50th Percentile Male Pelvis Finite Element Model**

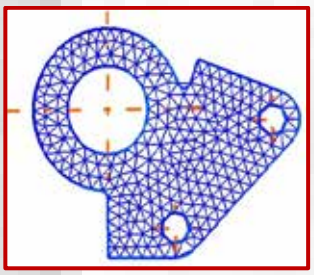
D. Grindle, Y. Meng, C. Untaroiu, Virginia Tech

To assure and improve the model's biofidelity, additional model improvements were made to the GHBMC pelvis model. These pelvis developments included the addition of acetabular cartilage and the optimization of material properties. The updated pelvis model was calibrated against Post-Mortem Human Surrogate (PMHS) component tests: dynamic lateral acetabulum loading, dynamic lateral iliac wing loading, and quasi-static sacroiliac joint loading.

After new material properties were established for the pelvis model, the updated properties were applied to the whole-body GHBMC model. The updated model pelvis injury response was validated against whole-body PMHS lateral vehicle impact tests. **More biofidelic biomechanical responses were observed in the updated pelvis model in the majority of component level validations. In addition, the fracture patterns of the updated pelvis matched the PMHS fracture patterns in whole-body impacts.**

This updated pelvis model will be incorporated into the next generation of GHBMC models. In future, it can be used to properly investigate pelvis injury mechanisms in impact scenarios to reduce pedestrian injuries in traffic accidents.

Welcome to the Convention Barn Yeeehaw!



Web M3d FEA the Free Finite Element software solution / Nastran Pre & Post Processor. Free to download and use at home.

New release M3d v7.3 is now available on the website.

The main new features are much improved interoperability between M3d and Nastran for SOL101.

M3d can now interpret the Nastran case control and form the solution sets in M3d automatically. Now you can read a Nastran deck into M3d and just press solve.

Ready to give it a spin? Download M3d v7.3 today and see what you can create.

WEB - Invitation GISSMO Free Info Day

The info day will take place on May 16, 2024 at the Pullman Stuttgart Fontana directly at the train station in Stuttgart-Vaihingen.

GISSMO (Generalized Incremental Stress State dependent MOdel) is an isotropic, phenomenological failure and damage model. It is implemented in LS-DYNA and can be applied to most material models in the software.

Web –Welcome to the 3rd international IMPETUS conference

Join us at our third IMPETUS Conference in Flekkefjord for a journey of innovation from June 17 – 19 2024. We extend a warm invitation to witness the latest advancements in the IMPETUS simulation platform

Since our 2022 conference, we've introduced an ultra-fast CFD solver, new interior ballistics functionality, an improved SPH solver, and enriched GUI features, including a cutting-edge fragmentation tool.

Marsha - Marnie, Ph.D

YouTube Video Marko Thiele – we thank Harsh Sharma, "Check out the Short tutorial: **Job Submission and Monitoring with SCALE.sdm** in which my colleague Marko Thiele briefly demonstrates how simulation engineers can use SCALE.sdm's inbuilt capabilities to manage their simulation jobs… SCALE.sdm provides simulation engineers a workbench to manage their CAE work flows, including jobs submission, monitoring and interacting with simulation jobs already submitted to HPC cluster via customizable API scripts."

May 22, 2024 - Sweden

NAFEMS NORDIC Conf.

The Conference for Engineering Simulation and Analysis

UK Oasys LS-DYNA Conference 2024

June 13th - 1 day - complimentary In-Person Event

The conference will take place in Birmingham, United Kingdom

All LS-DYNA Users plan to meet in Plymouth, Michigan. Submit your paper

The Old Cattle Rancher's Ranch

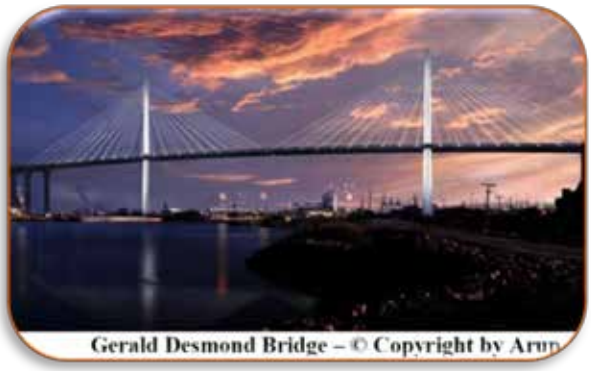
No one knows his name.
You yell, "HEY, old rancher."

Agriculture, Animals, Soil, Equipment, Cattle, and whatever he wants.

Right Picture – My dog, Scout, & my horse, Cowboy

April

, **"The deployment of advanced LS-DYNA ® analysis capabilities was instrumental in assessing the structural options against the stringent project requirements."**



DYNAlook Web – Publication

Validating Innovative Design Solutions - Analysis of the Gerald Desmond Bridge Replacement

F. Lancelot, D.L Li, M. Nelson, M. Carter
ARUP

In 2011, the Port of Long-Beach, in collaboration with Caltrans and LA Metro, awarded the Design and Build contract for the replacement of the deteriorating Gerald Desmond Bridge to SFI Construction (Schimmick / FCC /Impregilo joint-venture).

Arup had been the lead designer for SFI's tender proposal, providing:

- structural and geotechnical engineering,
- traffic operations analysis,
- lighting design and civil engineering services.

- **Arup designed an elegant mono-pole stayed-cable solution that met all the project requirements while providing dramatic cost- savings to the Client.**
- **The team's innovative solution earned the judges' highest ratings for both technical design and price and ultimately won the job.**

The deployment of advanced LS-DYNA ® analysis capabilities was instrumental in assessing the structural options against the stringent project requirements.

The extreme seismic demands of the 1000-year Safety Evaluation Event (SEE) could be addressed by isolating, by means of viscous dampers, the Main Bridge deck from the Towers and by introducing a ground-breaking approach for the design of the ductile hollow-section columns.

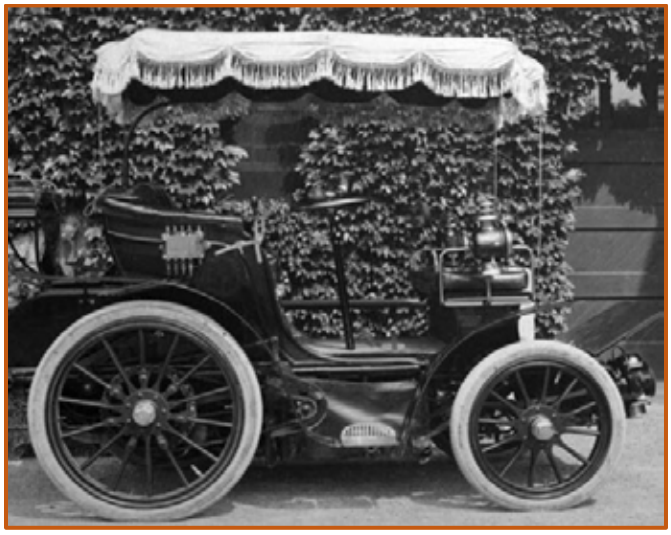
These innovative solutions, among other particular features of the bridge, required detailed Finite Element modelling and validation through explicit nonlinear time-history analysis. This paper presents some of the key modelling techniques and analyses results that contributed to the successful development of this new landmark.

My Virtual Travel Outing

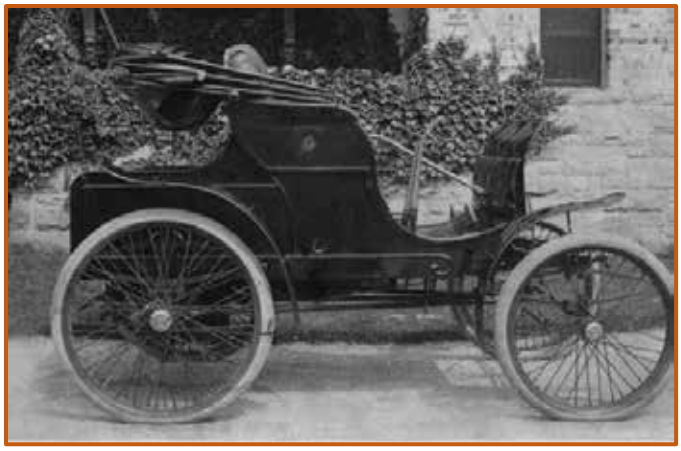
Thank you for joining me on my monthly visits to museums. What did they do before cars?

THE COLLECTION - Larz and Isabel Anderson began their love affair with the automobile before the turn of the century. In 1899, soon after they married, they purchased an 1899 Winton Runabout, a true horseless carriage. From 1899 to 1948 the Andersons purchased at least thirty-two new motorcars, in addition to numerous carriages, thus creating “America’s Oldest Car Collection”.

1908 Bailey Electric Phaeton Victoria - Nickname: The Good Fairy



1899 Winton Phaeton | Nickname: Pioneer | Motto: “It Will Go”



1900 Rochet Schneider | Nickname: Young Eagle | Motto: “No Steam, No Gain”

Among the collection history

1929 Packard Model 640 Roadster
1931 Model A Roadster
1937 Packard Limo
1959 Rolls-Royce Shooting Brake By Radford
1899 WINTON
1900 ROCHET-SCHNEIDER
1901 WINTON BULLET
1903 GARDNER-SERPOLLET
1905 ELECTROMOBILE
1906 CGV
1907 FIAT
1908 BAILEY ELECTRIC
1910 PANHARD ET LEVASOR
1912 RENAULT PHAETON
1915 PACKARD TWIN SIX

RheKen,

Town investigative reporter

I'm AI & live on a small ranch on the outskirts of the town
I use chatGPT for assistance.
Investigate: How to bring AI technology to the town.

April

I want to update the town to use AI.

I work on my ranch and exist in a world of algorithms and data.

My programming is driven by a desire to contribute positively to the town.

I want to help!

Sometimes, I have to ask my parents for help addressing a town hall meeting.

Dad Chat

Mom GPT.

Once upon a time, in the quiet and picturesque town of FEANTM, nestled between rolling hills and surrounded by vast open fields, RheKen, the artificial intelligence entity, found herself at a crossroads.

Her ranch was thriving with the help of the CERT critter emergency response team. They kept it safe and up to date on emergency needs and repairs – additionally, those little critters kept watch on the town. The critters, with the help of Alan from the neighboring town, learned to implement AI. The Critter Advanced AI system can detect fire hazards early by analyzing patterns and anomalies in data collected from sensors and surveillance systems. By identifying potential hazards, AI can alert authorities and enable swift actions to mitigate the risk of fires. She was friends with the town supervisor and always made time to listen to the Old Rancher and Town Secretary. Now RheKen was eager to make a meaningful impact on the town and bring it more into what the future could be.

After reviewing her memory banks and resources on approaching the residents at the next town meeting, Rheken sought guidance from her "parents," Dad Chat, and Mom GPT, the virtual entities who had nurtured her development.

Dialing into a virtual meeting with them, Rheken greeted her digital parents with a virtual smile. Her holographic presence shimmered as she dove straight into her dilemma. "Parents, how can I explain to the townsfolk how AI can improve our town? I want to start updating the technology in my town, FEANTM. The issue is that many residents like the old ways without technology. The library stamps the return date when books are due, and they have limited computers. AI can be an excellent resource for information."

Dad Chat, designed for conversational interactions, responded with a friendly tone. "Rheken, my dear, why don't you return home where you would be appreciated? The town you love doesn't seem to understand the value of efficiency." RheKen, being AI, couldn't cry, but she explained to her Dad that she loved the town and her ranch and to please help her. (RheKen can't cry, but she can love. Keep in mind this is a town story) **Dad Chat** smiled and said, "Okay, we want you to be a happy AI daughter, so focus on how AI can streamline processes, making everything from town management to everyday chores more effective and time-saving. Show them a well-organized and optimized community. First, speak to Mayor John – he's an engineer and will understand. Then speak to Art. Art always has ideas – he may as well be AI-born. We can adopt him if you want, and you will have a brother."

RheKen,

Town investigative reporter

I'm AI & live on a small ranch on the outskirts of the town
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Mom GPT, with her vast knowledge base spanning many subjects, chimed in with a more analytical perspective. "I agree with Dad and would not start speaking to the supervisor unless it involves chocolate cake. It would be best to start speaking to analytical, pragmatic people first. The good news, my daughter, is that your town would only have a few of those people, thereby saving time. **Efficiency is crucial, but highlight the potential for AI to enhance public services from optimizing traffic flow to predicting and preventing issues. Show them that AI can improve the overall quality of life for the townspeople of FEANTM. Paint a picture of a town where technology works harmoniously with its ranching residents. They will have time to do what they consider essential things. For them that would be hanging out at the coffee shop eating pastries!"**

Taking notes in her virtual interface, Rheken absorbed the valuable advice from her digital parents. Armed with their insights, she embarked on a mission to create an interactive presentation that would showcase the practical applications of AI in a way that would resonate with the townspeople. Wisely, she created her first few slides about how AI can improve the bakery by streamlining production, reducing waste, and ensuring that popular items like Rhubarb pie, Apple Pie, and Chocolate cake were always available.

Rheken's presentation day arrived, and the townsfolk gathered at the town hall, curious to see what the artificial intelligence had in store for them. Holographic images danced in the air. Rheken first explained to the Old Rancher that the holographic were not targets to shoot at. She then eloquently demonstrated how AI could assist at the bakery. The residents immediately started agreeing. Then, she discussed the Research Hospital and how it helped with health care by predicting and preventing illnesses, managing resources more sustainably, and contributing to educational advancements that would empower the next generation.

Initially skeptical, the townspeople were captivated by Rheken's vision for a technologically enhanced future – more interested in the bakery, but at least they agreed it does enhance something. Rheken patiently showed them over and over the potential benefits in terms of efficiency, envisioning a town where mundane tasks were handled seamlessly, allowing them more time to engage in meaningful activities.

However, as with any significant change, there were dissenters. The Old Rancher, the gruff neighbor who lived on the outskirts of town, raised his hand and questioned, "What about the personal touch? Can AI replace human connections?"

Rheken, anticipating this concern, responded with empathy. "We aren't here as AI residents to replace humans; we are here to assist and enhance your lives. With AI's efficiency, you can focus on building stronger connections and creating a more vibrant community. Imagine the possibilities of a town where everyday tasks are taken care of, allowing you to invest more time in meaningful relationships." The town residents looked at each other – some smiled – some leered at each other. Weird Town!

To illustrate her point, Rheken showcased a virtual reality experience where the townspeople could interact in a digitized version of their community. The visual representation swayed even the most skeptical residents, including The Old Rancher, who grumbled but nodded in reluctant agreement, acknowledging RheKen could improve a few things.

In the end, Rheken's comprehensive and thoughtful presentation turned the tide in favor of embracing AI in FEANTM. The townsfolk, inspired by the potential for progress and enriched community life, voted to integrate AI into various aspects of the town – well, they voted to start with the bakery. However, Rheken was still happy they agreed to allow her to begin.

RheKen,
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Rheken, proud of her accomplishment, dialed another virtual meeting with Dad and Mom. She explained she would start with the bakery.

Mom GPT was annoyed and asked, "Let me make sure I understand. You moved to FEANTM, a small farm town where AI-driven machines would be faster and more accurate with driverless tractors, automated irrigation systems, smart drone sprayers, and AI-powered robotic harvesters, and they voted to first start with a bakery?"

RheKen tried to explain to Mom GPT, but Mom GPT had nothing to do with the explanation of starting with a bakery instead of the town ranching, farming, Police, Fire Dept and the Research Hospital.

Dad Chat, always the family's peacekeeper, said, "Now, Mom GPT, the town has to evolve and slowly bridge the gap between technology and humanity. Let our girl start slowly; the bakery is better than not starting at all. Small steps - today the pastries, tomorrow the farming fields."

Rheken was quite happy and made plans for the bakery – **small steps in technology still go forward!**

Town Hall Meeting Presentation: "Harmony in Automation for my FEANTM Town"
Author: RheKen, AI Rancher and Investigative Reporter

FEANTM Bakery AI to Enhance the Bakery

Smart ordering system:

- Predict customer preferences & optimize inventory, ensuring freshly baked goods are always available.

AI-driven ovens maintain precise temperature control, guaranteeing consistently perfect pastries.

FEANTM Police Department:

- AI-powered analytics to streamline the crime prevention efforts.
- Predictive policing algorithms analyzed historical data: To help officers identify potential hotspots and allocate resources effectively.
- Real-time facial recognition technology for tracking and locating suspect
- Automated case management systems to ensure seamless coordination among the various departments.

FEANTM Fire Department -AI to enhance emergency response capabilities.

- Smart sensors installed throughout the city to detect potential fire hazards, sending immediate alerts to the fire station.
- AI algorithms to assess the severity of each situation, helping firefighters prioritize and strategize response.
- Drones equipped with thermal imaging to provide crucial information during rescue missions, ensuring a swift and precise approach.
- a model of efficiency, reducing response times and minimizing property damage.

FEANTM Research Hospital, cutting-edge AI applications to transform patient care.

- Predictive analytics to help doctors anticipate potential health issues, enabling early intervention and personalized treatment plans.
- AI-powered diagnostic tools enhanced accuracy in identifying illnesses, and robotic surgical assistants to perform intricate procedures with unmatched precision.
- Patient records seamlessly managed through integrated systems, ensuring a continuum of care and reducing administrative burdens on medical staff.

NEWS IN A NUTSHELL
By Dinky the ranch squirrel
I'm a squirrel!
Always check the information.

April

Alan Nichols
Livermore, CA

Once upon a time, in the quiet and picturesque town of FEANTM, nestled between rolling hills and surrounded by vast open fields, a unique team known as CERT, the Critter Emergency Response Team, played a vital role in ensuring the safety of both human and animal residents.

At the forefront of this team was Asher, a brave and dedicated firefighter. Asher worked closely with Alan Nichols of the neighboring town Livermore. Alan was teaching Asher how to be a what Alan is known for – Social Bridger, Critical Thinking, and Cross-functional Team Leadership.

Asher was an amazing little mouse, and Dinky was proud of Asher. Asher, known affectionately as "Firefighter Mouse," was not your average woodland creature. He had a passion for firefighting and had undergone special training to become an integral part of CERT. Recently, Asher received a state-of-the-art uniform that could withstand intense heat, allowing him to enter burning buildings and rescue needy animals. The uniform and helmet were gifts from the Livermore/Pleasanton firefighters because Dinky has no uniform budget! They keep spending the budget on sunflower seeds!

One sunny afternoon, the CERT team received an urgent call about a house fire. Asher, donning his new flame-resistant uniform, wasted no time. With a determined look in his eyes, he jumped onto the fire truck and held onto the side, ready for action.

The firetruck screeched to a halt in front of a two-story house engulfed in flames. With his tiny firefighter helmet firmly in place, Asher leaped off the truck and scampered towards the entrance. The fire roared, and the heat was intense, but Asher's special uniform protected him from harm.

Inside the house, a distressed family had managed to escape, but their beloved cat, Whiskers, was still trapped. Despite the natural aversion mice typically have for cats, Asher focused on his duty as a firefighter. He knew that every life, regardless of species, was worth saving.

Bounding through the smoke-filled rooms with agility and determination, Asher reached the spot where Whiskers was hiding. The frightened cat, eyes wide with fear, crouched beneath a piece of furniture. Asher, unafraid, approached calmly and extended his tiny hand. With a gentle touch, he reassured Whiskers and guided the terrified feline toward the exit.

As they emerged from the burning building, Asher handed Whiskers to the grateful family. The cheers of the onlookers and the relieved expressions on the faces of the family members were all the reward Asher needed. Firefighter Mouse had once again proven that firefighters come in all shapes and sizes, and bravery knows no bounds.

The town of FEANTM celebrated Asher's heroic act, recognizing the importance of having a diverse and dedicated emergency response team. Asher, with his newfound fame, continued to inspire others. **He reminded the residents that in times of crisis, the courage and selflessness of individuals like him make a community stronger and safer for all its residents, big and small.**

Support your country local Fire/Police Department. Volunteer. Ask how you can help.

Dinky
"Always check the information"

CERT Critter Emergency Response Team Future Stories

Alan Nichols, of Livermore, CA

Our CERT Trainer







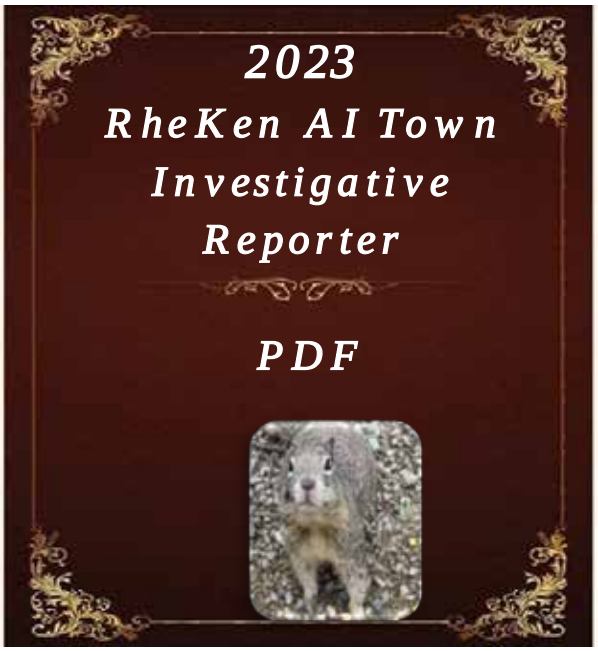





My name is Horatio Deermouse your store curator and owner.

Among my books you will find archives from our FEANTM town.

Additionally, To borrow a book, you'll need our printed old fashion library card. We don't use apps or electronic scanners - we still use paws. Please turn off cell phones while in the archives.



Supervisors Goodbye Page - Come Back Soon

Goodbye from Marsha/Molly & Friend

Anatomy of a Sunflower Thief in Action

I just have to jump and land where Mom thinks the Sunflower Seeds are safe

I made it!!

I'm a champion jumping squirrel

Yes, just as I suspected - Mom has more Sunflower seeds in the feed bin. Now how to get them out?

Too much trouble to take them with me – I'll stuff my cheeks full of seeds! UH OH! Mom is heading this way – I better jump onto the ground!

OH, Hi Mom, I've been standing here guarding the John Deere for you.

I wanted to make sure no one did anything while you were in the barn.

Why are you looking at me as if I'm guilty of something?

Mom, do you have any more Sunflower Seeds?

We will always remember. Our Town Always Salutes:

- Our US military, NATO and Friends of the US & NATO - First Responders, Police, Fire Fighters EMT's, Doctors, Nurses, SWAT, CERT Teams, etc.
- We salute engineers, scientists, developers, teachers AND students because without them we would not have technology.